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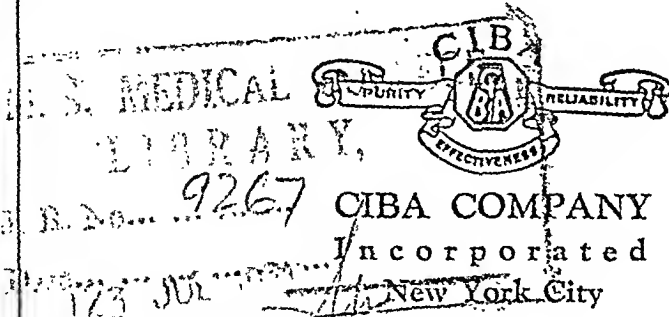
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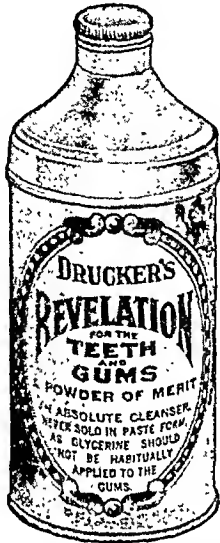
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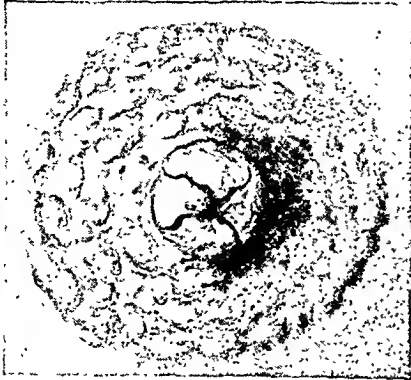
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*Archives of Pediatrics, Oct. 1923, Pg. 646.



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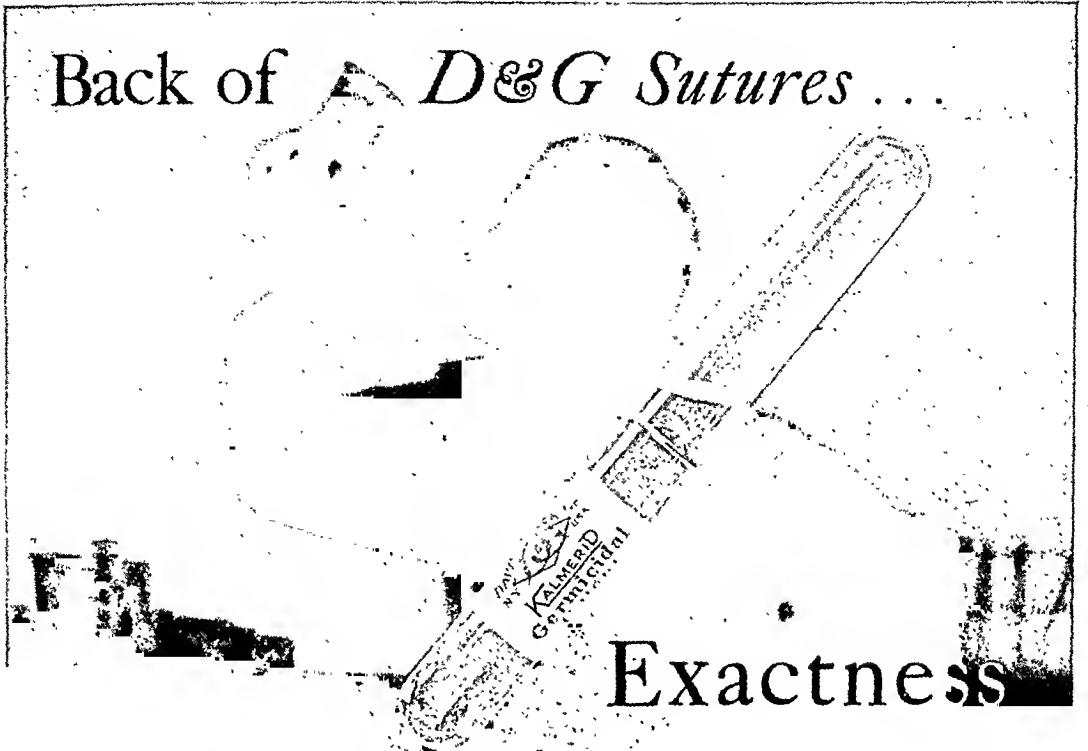
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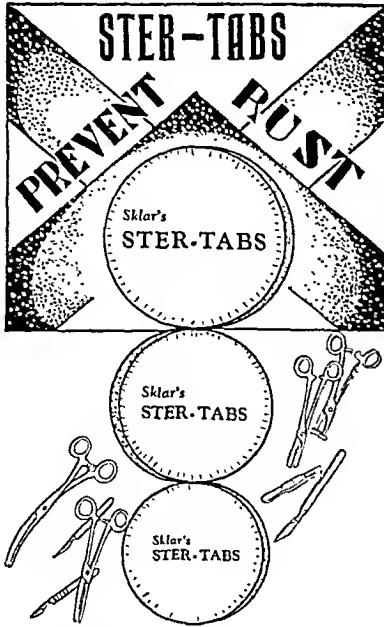
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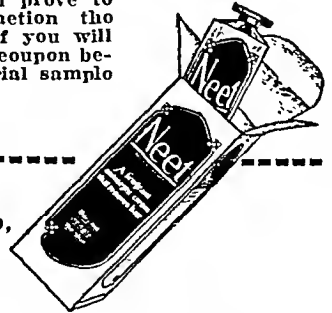
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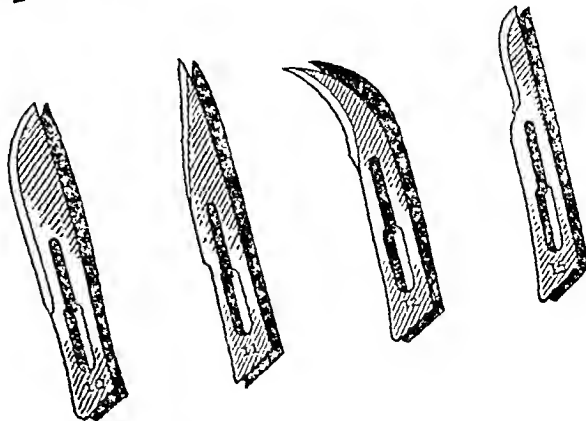
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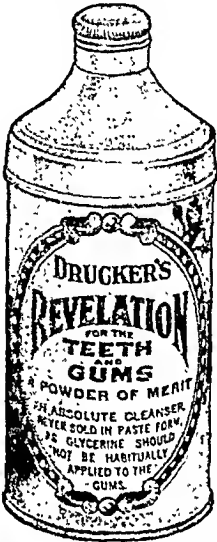
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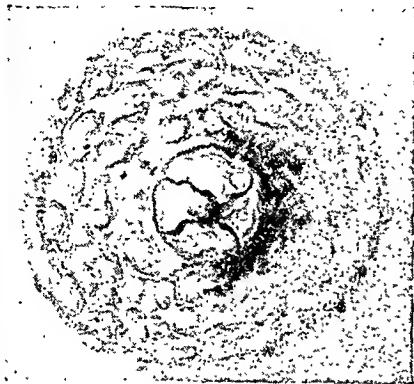
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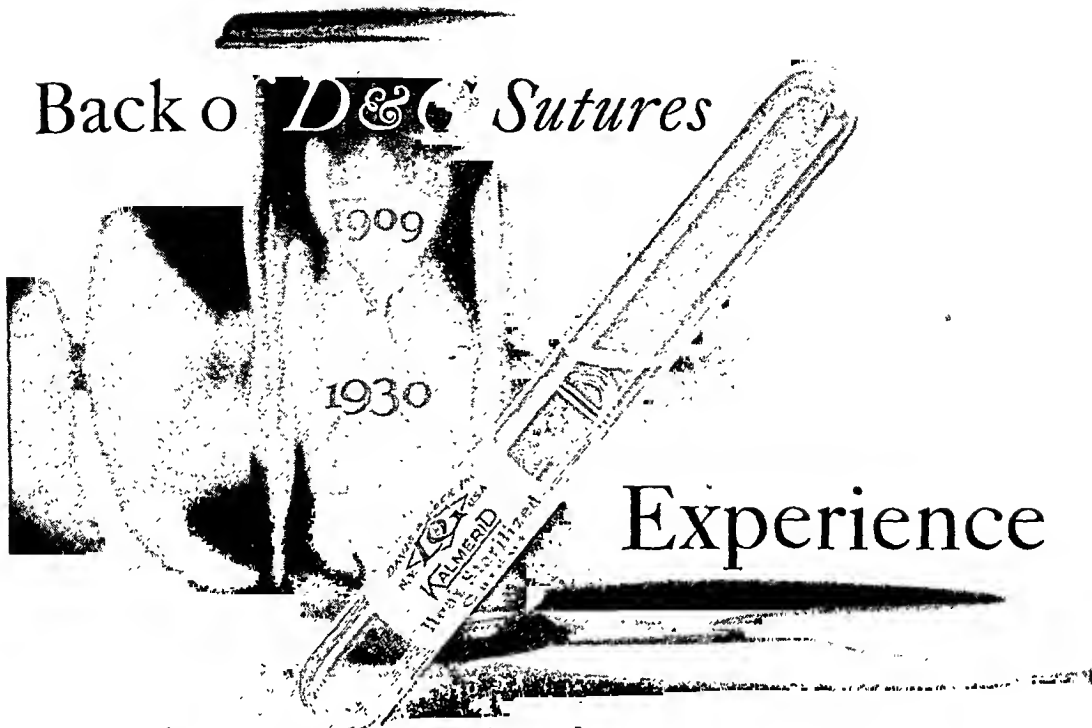
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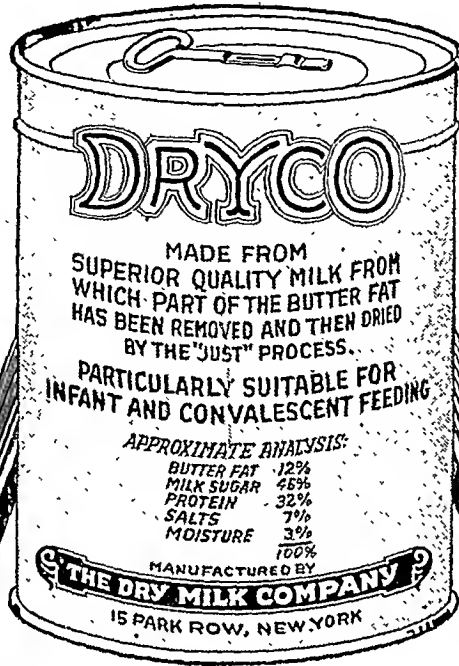
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VOL. XIX

ST. LOUIS, JANUARY, 1930

No. 1

Original Communications

OBSERVATIONS ON THE RESULTS OBTAINED IN THE TREATMENT OF STERILITY*

BY BROOKE M. ANSPACH, M.D., PHILADELPHIA, PA.

(From the Gynecological Department of the Jefferson Medical College Hospital)

THERE are few achievements in the practice of medicine that give greater satisfaction than the successful treatment of sterility. While a surgeon may feel that he has been of some real service by the prompt recognition and treatment of a ruptured ectopic or a perforated ulcer, and while an obstetrician may sense an even greater accomplishment by the safe delivery of a healthy child after labor requiring much patience and skill, it is an attainment sometimes even beyond such deeds to effect the implantation of an embryo in previously infertile soil.

Many papers have been written on the etiology of sterility, but there is a paucity of information as to exactly what has been secured by treatment. Inasmuch as the woman who consults a physician for that purpose may be subject to much inconvenience and trouble in the investigation of her case and in the treatment, it is quite proper that we should evaluate our results, so that we may know approximately what can be done. Dickinson and Cary have already made this observation and have submitted a detailed report of their own cases; Hunner and Wharton, Polak, and others also have published their results in varying degrees of completeness.

The further one goes, the more one is impressed with the labor required to make an adequate investigation of this sort. It is time-consuming and it involves much study and intimate questioning of the

*Read at a meeting of the Section on Obstetrics and Gynecology, New York Academy of Medicine, March 26, 1929.

patient and her husband. If these examinations were to be adequately paid for, they would lie beyond the resources of many patients. I find much lacking in my own records. As I have proceeded with the question, I have become aware of more and more details that should be uncovered in each case. It is apparent that the individual busy practitioner has little more than time for the easy problems and not enough for the difficult ones.

In the following study of my own cases I have put them into three series, A, B, and C. Series A includes consecutive patients seen in private practice from January, 1923, to January, 1928. They consulted me because they were sterile. When sterility was not mentioned and the patient did not express the desire to be made fertile, she was not included. Sterility in some was complained of in association with such symptoms as leucorrhœa, oligomenorrhœa, amenorrhœa, and dysmenorrhœa. Patients with gross pelvic lesions and outstanding symptoms, for example, myomata with hemorrhage, pelvic inflammatory disease with pain, in whom sterility existed as a coincident symptom, but was not particularly noted or complained of and for which treatment was not sought, are excluded. Only those cases are taken in my first series in which the patient was willing to undergo whatever studies were deemed necessary and anxious to follow out a definite line of treatment. The number in this series is 55 and the problems that are dealt with relate more especially to the pathology found in the woman, all of the men having been judged capable of fertilizing in so far as they produced living and healthy spermatozoa.

Series B includes all of the private patients *seriatim* that consulted me during the same period of time who were not subjected to the usual study. Some were sent by their doctors for an opinion only and not for treatment; others responded so quickly to simple measures that further consultation was unnecessary; in two, distinct operative indications were found and undertaken irrespective of sterility and both were quickly successful; and finally a large number for one reason or another, even though general advice was taken, did not come back for further study and observation. The number of cases in this series is 69. In none was there any investigation beyond the ordinary pelvic examination, there was no study of the husband or of the patency of the fallopian tubes.

The third series, C, included eight cases in which the husband was found to be absolutely sterile and no further examination or treatment was prescribed for the wife. Clinic or dispensary cases were not used. From my experience in private practice I believe the difficulties encountered in out-patients, quite insurmountable.

When is a marriage barren? When does sterility exist? In the selection of my cases I felt originally that unless a marriage had been unfruitful for at least two years, it might not properly be classified as a

case of sterility. Most of them are of this length or longer; nevertheless in view of the opinions of Fosdike and others, I have come to the conclusion that a woman living in a normal marital state, who fails to conceive within twelve months of marriage, may be regarded as potentially barren. It is to be admitted that many cases regarded as sterile at the end of a year may be relieved by very simple measures. The use of contraceptives of course must always be taken into account in estimating the duration of sterility.

Varieties of Sterility.—There are many classifications of sterility, but for the purpose of this report two have been selected; viz., *absolute* where conception has never occurred; and *relative* when it has occurred at least once, but for a considerable time notwithstanding opportunity and effort, there has been no repetition.

Relatively sterile cases may be subdivided into two groups: (A) *Those in which conception ended in miscarriage* either (1) induced, (2) occasioned by gross lesions, or (3) arising from an unknown cause. The latter is especially seen in repeated miscarriages. "Habitual miscarriage is effectively a form of sterility" say Reynolds and Macomber. One must not deny the fact that in some so-called early miscarriages, especially those associated with previous irregularity and scanty menstrual flow, the pregnancy really did not exist at all. (B) *Those in which the pregnancy went on to term, a one-child sterility.*

The Procedure in the Examination of the Woman.—The history is planned to shed light upon those etiologic factors which are known to influence the occurrence of conception.

1. *The menstrual type* and whether it denotes normal, excessive or subnormal development and function of the uterus or of the ovaries and its accessory endocrine glands.

2. *Other indications of endocrine disorders* as exhibited by body form, quickness of response, secondary sexual characteristics, etc. Certain tests affirm or disprove our suspicions in these particulars, as, e.g., basal metabolism, differential blood counts, x-ray of the pituitary body, sugar tolerance, test for the female sex hormone, examination of the visual fields, etc.

3. *Evidences of constitutional states promoting sterility*, including overweight from lack of exercise, nervous overstrain, psychasthenia, tuberculosis, anemia, autoinfection, etc. "These depressing constitutional conditions affect both sexes equally, decreasing the activity of the testicles and ovaries until these organs fail to produce normal spermatozoa or ova." (Reynolds and Macomber.)

4. *Previous acquired diseases affecting the pelvic organs in youth or adult life.* The most common is gonorrhoea; also appendicitis, tuberculosis, some of the exanthematous diseases, and in relative sterility, postabortal or postpartal infections.

5. *A thorough pelvic examination* and search for the evidences of inflammation of the cervix, uterus or tubes, malformation and subdevelopment of the pelvic organs, gross lesions such as retroflexioversion, myoma, or ovarian cyst.

After these preliminaries and general survey, one is ready to proceed with the more active inquiry for other etiologic factors.

Hühner's Test.—In the direct examination of the patient to determine the cause of the barren marriage this was the first test made. If no living sperms were found, the husband was sent to a urologist and if a further observation showed that he was incapable of procreation, no further investigation was made of the wife. Hühner's test gives us information at the outset relative to the husband which sometimes he affords unwittingly. There are many husbands who reluctantly submit to any examination of themselves.

In giving directions to the patient and her husband for the Hühner test we have carried out a plan very much like that of Cary and called by him an "insemination test." The patient is directed to empty her bladder before intercourse, to remain in bed for five minutes afterward, to put on a perineal pad before arising, dress quickly and present herself for examination without either washing the external genitalia or emptying the bladder. In every case this examination has been made within an hour. In the large majority there was no marked impairment of the activity of the spermatozoa found in the vaginal vault. Dead sperms were frequently found at the introitus. It was noted that sometimes the semen had almost entirely escaped from the vagina.

In the earlier work no examination was attempted of the cervical mucus, for it seemed obvious that if healthy semen were deposited on the cervix and in the vaginal vault and remained there for a time, the spermatozoa were bound to get into the cervical canal. As my studies went on I did find that the sperms in the cervical mucus exhibited a much higher grade of motility than those lying in the vaginal vault even though they were close to the external os. Unquestionably a differentiation in the motility between spermatozoa in the vaginal vault and in the cervix gives us an index of the influence of the vaginal secretion in an individual case.

I have not made any studies of the vaginal reaction as shown by reagents. Meaker and Glaser studied the hydrogen-ion concentration of the endocervical secretions. They noted the older view that all sperms normally remained for a time in the vaginal vault before entering the cervix and the newer one that the vaginal secretion was hostile to the sperms and that for successful coitus the semen must be deposited upon the cervix at the time of ejaculation. As a result of their studies the authors conclude that the vaginal reaction is ordinarily unimportant.

Moench also does not believe that vaginal acidity is a cause of sterility. He says that vaginal disease decreases acidity and except during pregnancy the acidity seldom exceeds 0.5 per cent of lactic acid, in which sperms may live for hours; furthermore the alkaline semen exceeds in volume the vaginal secretion. Moreover the sperms do not remain for a long time in the vagina, the active forms traveling from 1 to 2 cm. in eight minutes. The recent report of Mason more or less corroborates this opinion.

Hühner declares that effluvium seminis is of no consequence inasmuch as it has been a prominent symptom in many prolific women. While admitting the truth of this statement, provided some of the sperms have been deposited upon the cervix at ejaculation, it must also be true that the retention of the seminal lake gives additional opportunity for the spermatic particles to enter the cervical canal. If the Hühner test shows healthy sperms in the vaginal vault, some of them will almost certainly obtain access to the cervix, especially if the patient takes an alkaline douche before coitus and lies with the hips elevated for several hours afterward.

Potency of the sperms was judged according to the observations of Reynolds in 1916. At that time he distinguished five varieties of motion, the first three of which indicated that the sperm was capable of fertilization. In answer to a recent inquiry Dr. Macomber replied as follows:

“At present we do not pay much attention to all the various types noted as was formerly done. We attribute a great deal of importance to the progressive, almost vibrationless, motion with which active normal sperm will cross the field. A spermatic particle with any vitality at all will show humping when it runs up against the edge of the film, or when it strikes a leucocyte. We do count the number of rows on the edge of the film of spermatozoa attempting to force their way out of the drop—this we call banking. The degree of banking present seems to be a real index of vitality. In general, undulatory motion is seen as spermatozoa lose their vitality or become chilled.”

There are other features of importance in a study of the spermatozoa. Thus the number is of considerable importance. It varies from 75,000 to 125,000 per cubic millimeter. The more there are the greater the chance that one of them will reach the ovum. I made no actual count, usually noting the findings as few, many, myriads, etc. The morphology of the sperm also is of great importance. This was first pointed out by Williams and Savage in their study of reproduction deficiencies in the bull. The morphology of the head is an index of its fitness and the relative number of abnormal forms affords a good index of reproductive power. The size and shape are best shown in stained specimens. Moench has confirmed the observations in man and written an excellent paper on the subject. No such studies were made in my cases.

Rubin Test.—This is the second of the important requirements in the study of sterility in women; because if the tubes are closed, conception

is impossible unless some successful operative treatment is performed. It is interesting to note, however, that the findings of one examination dare not be taken as absolute. I have had a number of cases that demonstrate this fact. In two of my negative cases a positive result was obtained in other hands. In one patient, the Rubin test was negative until a retroflexed and retroverted uterus was supported in normal position with a pessary; then the test became positive and pregnancy subsequently occurred. In another patient with retroflexioversion and apparent inflammatory lesions, the Rubin test was reported negative and yet this patient has just been delivered of a full-term healthy baby.

As a result of such experiences it has come to be regarded as necessary before final negative report is made to repeat the test and to precede the second one with the use of an antispasmodic and by replacing the uterus if its position is abnormal. In some hypersensitive patients a general anesthetic is required.

As will be noted in our case reports abnormal kymographic tracings and high pressures have been taken as evidences of partial closure or other tubal pathology.

Lipiodol injection of the tube and x-ray study has been done when the tubes were closed and the patient desired to have done whatever operative procedure was needed to overcome the obstruction. Two x-ray exposures are made, one immediately after the lipiodol injection—another twenty-four hours later. In one or two instances the second picture showed that some of the solution had found its way out of the tubes into the peritoneal cavity. This may mean that absolute evidence of complete closure is obtainable only after a lipiodol study. In a number of instances persufflation of the tubes has seemed to favor conception; in one the high pressure was 180.

Further Observations of the Husband.—A barren marriage is a two-person problem. It is now a common observation that the husband may be just as often responsible for the sterility as the wife. It appears that he is much less subject to endocrine disorders, but unquestionably he is more often the original bearer of venereal infection which he may transmit to his wife, and he is more frequently affected by physical and mental strain, irregularities of diet, etc. He is just as often in all probability the subject of incomplete or faulty development of the pelvic organs. The cooperation of the husband is especially essential and in a considerable number of my cases of both series it was hard or impossible to obtain. This was frequently acknowledged by the wife.

It is, of course, unquestionable that the wife usually is much more desirous of having children than the husband. In a certain proportion he is indifferent or even rebellious to thorough examination and treatment. One of my patients said her husband was a Christian Scientist

and for that reason objected to any personal examination or treatment. Another woman thinking her husband might be at fault and desiring to shield him, said she would not wish him to know even if her suspicion proved to be true.

In my series B I am sure that many of the patients who did not accept the advice given in so far as it related to further study by Hühner's, Rubin's and other tests, were influenced by their husbands either because the latter feared they were at fault and shunned the exposure or because the expense of the procedure with the uncertainty of the returns turned them against it.

TREATMENT OF STERILITY

General Proconception Advice.—Vitamine A diet and the administration of calcium lactate is especially indicated. The first writings upon this subject with which I am familiar were those of Reynolds and Macomber. They announced the decided influence upon procreation in the lower animals, notably rats, by the addition to or withdrawal from the diet of calcium salts. The report by Evans in the University of California Press in 1925 on the antisterility vitamine fat soluble E was very striking. By the withdrawal of this substance, or the use of it, the rat may be made sterile or fertile, as desired. While this substance occurs in beef, milk and eggs and some of the vegetables (lettuce) it is also found in concentrated form in the oil of germ wheat. Macomber has recently added to his previous work, increasing or diminishing the fertility index of mated rats by modifications in their diet.

The influence of the diet exerted upon both the husband and the wife. Of the greatest importance often in the selection of the diet is the necessity of reduction in the patient's weight. While obesity may not be the cause of sterility, it is very frequently associated with evidences of diminished ovarian function and ovulation. A reduction in weight very often is followed by improvement in the manifestations of the menstrual and reproductive functions. While loss of weight is certainly favored by the use of thyroid and anterior pituitary substance, one must not rely so much upon them as upon a reduction of the total food calories per day. This will often require much tenacity of purpose on the part of the patient and continuous supervision by the physician.

Endocrine Therapy.—The value of endocrine therapy has been disputed in many quarters and one cannot prove that such products as desiccated ovaries or desiccated anterior pituitary substance have any real therapeutic worth. Yet there is nothing better to offer; the ovarian substance when the periods are scanty or delayed and the anterior pituitary when the patient is excessively obese and has a basal metabolism within normal limits. I am convinced of favorable results in a number of cases. One must insist that the patient regard these sub-

stances more as a food than as a medicine and take a certain amount every day over a long period of time before giving them up.

When the basal metabolism was low, and this was not often, small doses of thyroid substance were given, watching carefully for any toxic effects. In one patient with a high basal metabolism, x-ray treatment of the thyroid was followed with success. Stimulation of the ovary with mild doses of the x-ray was used in one case associated with amenorrhea, with no result. Of especial interest is the explanation in successful cases of the destruction of persistent corpora lutea that have been inhibiting ovulation and menstruation (Thaler).

Regulation of the Sexual Act.—So far as the regulation of the time of coitus in its relation to the menstrual periods is concerned, in the earlier part of our studies it was recommended that coitus should be more frequently practiced between the twelfth and the twenty-fourth day following the menstrual period. This was in accord with the views of Meyer, Ruge, and others as to the time of ovulation. There is some difference of opinion in this respect, but the figures of Issmer, quoted by Novak, seem to show that conception is more frequent after coitus during the first week following the menstrual period and diminishes in frequency from that time until the next period. It is, of course, obvious that the sperms may be deposited in the generative tract and lie there for some time before an ovum appears so that the time of coitus is not necessarily the time of conception.

Temperance has been advised in the sexual relations in the belief that one vigorous cohabitation was worth several forced ones. It need not be mentioned that abuse lowers the powers of procreation. In this connection it is interesting to note the recent experimental work of Jarcho with female rabbits and the ability to destroy their fertility by the intramuscular injection of spermatozoa. An engaging explanation of this action is the production of spermatoxic substances in the vaginal or uterine secretions.

While it has been recognized for a long time that the fullest active participation in the sexual act on the part of the woman is not requisite for conception, it must be that in some cases of sterility a lack of sexual feeling and a failure of the climax or orgasm may be responsible. The writings of Dickinson upon this very point are of much value: it is a difficult subject to present in its entirety to the wife, but it can be freely discussed with the husband. It has been brought to my attention more than once by the patient herself.

Preceding coitus an alkaline douche of soda bicarbonate or sodium chloride 1-500, evacuating the bladder and making all preparations for the night, continuance of the recumbent posture after coitus and elevation of the hips for six to eight hours are helpful.

In addition to these general proconceptive measures, other therapeutic measures have been employed including local treatment and opera-

tions, applications of silver nitrate to the vaginal mucosa and vulva in cases of erythema; investigation of the urine and the correction of any abnormalities, the use of an antiseptic douche between the times of coitus for leucorrhœa; cauterization of the cervical lips in profuse cervical leucorrhœa from eversion; cauterization of the cervical canal and puncture of cysts in cervical catarrh or endocervicitis; dilatation of the cervix and the introduction of a stem in pathologic ante flexion and stenosis; replacement and introduction of a pessary in retroflexion or inversion of the uterus; or shortening of the round ligaments.

Myomectomy was employed when the size and situation of the tumors were a probable factor in the production of sterility or probable causes of abortion if conception did occur, provided the uterus would not be left grossly misshapen or the uterine cavity distorted.

There were no pregnancies after salpingostomy in this series even under the most favorable circumstances; viz., an outer bulbous closed extremity in which it was only necessary to open the tube, excise a portion of the wall, and unite the mucous with the serous coat. This was accomplished without manipulation of the other pelvic organs, hemorrhage or other conditions favoring the recurrence of inflammation or adhesions. The excellent results of Gellhorn and Kerwin following salpingostomy indicate that here is a promising field.

In one case at least in which I opened the abdomen for the purpose of doing a salpingostomy I found it technically impracticable to follow out my original intention. I have done relatively few salpingostomies. Not many patients elect the procedure in view of the doubtful outcome, and I never urge it, preferring to lay the facts before the patient and let her decide. This perhaps is very generally the experience of others.

I have no doubt that Gellhorn's suggestion of the prolonged use of heat, injection of aolan, etc., before operations are undertaken on a tube of this character will do much to improve the result. I think it is also quite possible that negative tubes treated with heat and aolan and subjected to repeated persufflation may subsequently be found patulous so that salpingostomy will be unnecessary.

I have been much interested in the surgery of the ovaries. Veterinarians attribute to ovarian abnormalities so many cases of sterility in cows. Martin Poulsen regards the persistent corpus luteum as the most important and common cause of sterility in cows. C. J. Marshall, professor of veterinary medicine at the University of Pennsylvania, recently made a statement that the persistent corpus luteum was responsible for 60 per cent of cases of sterility in the cow and that 90 per cent of these cases were cured by the manual expression of the corpus luteum by rectal manipulation. Not all veterinarians agree with these views, Albrechtsen, for instance, admits that such conditions often exist in the ovaries of sterile cows but regards the ovarian changes as secondary to inflammatory processes in the uterus.

Inasmuch as it has been shown that the morphology of the sperms and the variations in their motility, etc., have probably such a vital effect upon their physiologic action and ability to fertilize, it must be that there are similar variations in the ovum. These changes, of course, can only be inferred, since the ovum is so difficult to find, by the gross or microscopic evidences of ovarian disease and by the manifestation of normal or pathologic ovulation as shown by the menstrual function.

Graafian follicle or corpus luteum cysts often may be enucleated without sacrificing the ovary itself. Other surgical problems are multiple retention cysts, persistent corpora lutea, and a thickening of the ovarian capsule. Here again with complete explanation to the patient, operations for that purpose alone will not often be elected. While we can detect ovarian enlargements without difficulty except in very obese women, the correct interpretation of the enlargement is a different matter.

RESULTS OF TREATMENT IN SERIES A

To show the result of treatment in Series A, I have tabulated them in five groups. The duration of sterility in any case may be calculated by noting the year of marriage and the year of the Rubin test.

Group A. Absolute Sterility. Frequently associated with: delayed, irregular and scanty menses; evidences of endocrine disturbance, obesity, etc. Tubes patulous—no gross lesion.

Treatment limited to exhibition of:

Calcium lactate
 Ovarian substance (unless periods were normal—exceptional)
 Anterior pituitary substance (if obesity was excessive)
 Thyroid substance }
 Roentgen ray } for thyroid dysfunction.

Limitation in amount and selection of food for the purpose of reducing weight in cases of obesity. Vitamine A diet. Regulation of, and alkaline douche before, coitus. Rest in bed. Elevation of hips for eight hours following coitus.

NO.	AGE	MAR.	RUBIN	CONCEPTION	RESULT
6	25	1919	Oct., 1923	After 11 mo.	Child at term
8	28	1921	Mar., 1924	After 3 mo.	Child at term
27	29	1921	Dec., 1925	None	
45	26	1923	Oct., 1926	After 4 mo.	Miscarriage
20	36	1919	Dec., 1926	None	
37	26	1922	Feb., 1927	None	
32	38	1926	Aug., 1927	Immediate	Child at term
2	29	1919	Oct., 1927	None	
48	30	1925	Oct., 1927	After 6 mo.	Child at term
24	32	1920	Aug., 1928	After 6 mo.	Child at term
11	29	1920	Oct., 1928	None	

Group B. Absolute Sterility. General symptoms as in Group A, but in addition to treatment advised for those cases some surgical procedure.

NO.	AGE	MAR.	RUBIN	PLAN OF TREATMENT	DATE	CONCEPTION	RESULT
53	30	1920	Sept., 1923	Routine and cervical stem	Sept., 1923	After 2½ years	Child at term
7	27	1917	Oct., 1923	Routine and cervical stem	June, 1924	After 3 mo.	Child at term
15	41	1923	Jan., 1924	Routine and cervical stem	Nov., 1924	After 2¾ years	Child at term
26	30	1924	Oct., 1925	Routine and left oophorectomy	Oct., 1925	After 3 mo.	Child at term
33	37	1924	Dec., 1927	Routine and pessary	Dec., 1927	Immediate	Child at term
42	36	1925	Apr., 1928	Routine and appendectomy	Apr., 1928	None	
			Apr., 1928	Cautery cervical	June, 1928	None	
13	32	1922	May, 1928	Routine and right oophorectomy	Jan., 1928	None	

Group C. Relative Sterility. General conditions and treatment as in Class A but in addition: local treatment of cervix, prolonged hot douches, etc., replacement of uterus and pessary, operation for retroversion.

NO.	AGE	MAR.	CHILD	MIS.	RUBIN	TREATMENT	CONCEPTION	RESULT
23	32	1914	1916	1920	Apr., 1923	Routine and cervical stem	None	Child, 1925
40	29	1919	1919	1922	May, 1923	Routine	After 1¾ yr.	Cesarean for tox., May, 1926
19	30	1910	1918	1910†	June, 1923	Routine	After 2¼ yr.	Child, 1926
25	32	1918	1916	1919	Oct., 1923	Routine	After 2 yr.	Mis. Jan., 1926
3	35	1912	1916	1919	Oct., 1924	Routine	After 3 yr.	Mis. Nov., 1928
12	29	1920	1922 stb.	1924	May, 1925	Routine and pessary	After 6 mo.	Child, June, 1926
10	28	1918	1919	1922	July, 1925	Routine and pessary	After 2 mo.	Child, June, 1926
1	25	1922	1921 stb.	1922	Oct., 1925	Routine	None	
46	28	1920	1921 stb.	1925	Dec., 1925	Routine and pessary	None	
43	25	1919	1923	1925†	Dec., 1925	Routine	After 1 mo.	Child, Oct., 1926
18	27	1922	1923	1924†	Mar., 1926	Routine	After 4 mo.	Child, Oct., 1927
38	29	1919	1919	1920	June, 1926	Routine and cervical stem	After 8 mo.	Mis. July, 1927
7A	29	1916	1919	1919	Jan., 1927	Curet. and rd. lig. short., Jan., 1927	None	
17	26	1922	1922	1922	Jan., 1927	Routine	After 12 mo.	Mis., July, 1928
30	28	1918	1923	1919	Jan., 1927	Routine	None	
4	38	1917	1923	1921	Feb., 1928	Routine	None	

Group D. Absolute and Relative Sterility—with patulous tube or tubes but abnormal kymographic tracings—high pressures or other indications of tubal pathology. Eight cases; one positive and one suspected conception, both ending in expulsion of uterine contents.

Group E. *Absolute and Relative Sterility.* Rubin negative. Thirteen cases: four salpingostomies: no conceptions.

Results in 55 Cases, Series A, in which the patient agreed to complete study and treatment.

	CASES	FULL-TERM CHILDREN	MISCARRIAGES	NO CONCEPTION
Group A	11	5	1	5
Group B	7	5	0	2
Group C	16	6	5	5
Group D	8	0	2	6
Group E	13	0	0	13
Totals	55	16	8	31

Conception in 43.6 per cent, except Group E (Rubin negative) 57 per cent.

Child at term in 29.0 per cent, except Group E (Rubin negative) 38 per cent.

Excluded from this series but occurring seriatim within same time period—absolute male sterility 8.

Husband absolutely sterile in 16.6 per cent of 63 cases.

RESULTS OF TREATMENT IN SERIES B

Later history of patients in Series B. 69 Cases in which patient was not studied

Accepted general advice but husband was probably sterile	3
Accepted general advice but did not return for study; no conception in	31
Accepted general advice but did not return for study; nevertheless conception in	9
Accepted general advice and conceived almost immediately	3
Accepted general advice; had operation; did not conceive	7
Accepted general advice; had operation; later conceived	2
Did not accept advice; no treatment; no conception	4
Did not accept advice; nevertheless conception	1
Accepted advice partly but went from one physician to another—conception in	3
No conception in	1
Accepted advice partly but soon after divorced	2

Summary of the results in 69 Cases—Series B

Conceptions	19
Full-term child	16
Miscarriage	2
Now pregnant	1

Comparison of the results in Series A and Series B

Conceptions	A	43.6 per cent
Conceptions	B	27.5 per cent
Full-term child	A	29.0 per cent
Full-term child	B	23.0 per cent

Results in all cases applying for treatment of sterility that could be followed up from 1923-1928

Total number of cases	132
Excluded because of absolute sterility in male	8
Followed advice and accepted complete study (Series A)	55
Did not return for complete study (Series B)	69

132

Conception	43 (32.5 per cent)
Full-term child	32 (24.2 per cent)

A comparison of the two series shows nearly as many full-term children in Series B as in Series A; 23 per cent as against 27.5 per cent. There were more conceptions in Series A (43.6 per cent), with 29 per cent in B, but also more miscarriages. This might indicate that where conception is forced, so to speak, the product is not so likely to survive. Altogether my results would seem to indicate that after all the general proconception advice was just as important in a curative way as any conservative or operative treatment.

In estimating the results of treatment one is constantly in danger of drawing fallacious conclusions. After a certain treatment is prescribed the length of time that elapses before conception occurs should be some index of its efficiency. One must not forget, however, that sometimes conception takes place after a long period of sterility with no accountable reason. I have two cases, not included in this report, in which after a period of sterility of twelve and fifteen years respectively, I found the patients pregnant at the time of the first consultation. In the first, aged forty-two, the idea of pregnancy had not been entertained, but an abdominal tumor was evident. In the second an amenorrhea had been ascribed to ill health. Such occurrences make one hesitate to give credit to treatment which is not followed in a little while by conception or to very simple treatment that at once brings results. One young woman had been married and sterile for three years; without any study of herself or of her husband the usual proconception measures resulted in the fulfilment of her hopes after one period.

It will be seen that in Group A, the successful results followed within a time short enough to make one believe that the treatment was responsible. In Group B there are two cases in which conception did not occur until more than two years after the introduction of a cervical stem. Here unquestionably the relationship of cause and effect is in doubt.

We must admit that notwithstanding all our efforts we find it hard to explain why conception occurs in one instance and not in another, even though they much resemble each other. A patient from another city sterile for ten years, thoroughly studied by an expert, at the suggestion of a well-intentioned friend, proposed a dilatation of the cervix. There was no indication for such a procedure and I sent her back to her original adviser. Two years later with no further treatment of the wife and more than eighteen months after one or two treatments of the husband, conception occurred. In her letter the patient stated that "No one was more surprised than Dr. X." The doctor of another patient who ignored my advice wrote as follows: "Mrs. Blank four months ago after an absolute sterility of six years gave birth to a full-term child; she underwent no treatment whatever, she just got preg-

nant somehow." Another patient with relative sterility (there had been one questionable miscarriage) carried out her treatment in a very desultory fashion and even abandoned it altogether for the greater part of the time. Two years later she conceived, as her husband explained it, because "they moved to the country." Another woman who was absolutely sterile for two years and refused suggestions that I offered, wrote "This is to inform you that I let Nature take its course and I just gave birth to a little girl." Another patient absolutely sterile for two years said: "It all happened down South one winter. We decided it must have been the air."

The determination of the real cause of sterility in a given marriage may be of great complexity, involving much labor. Scientific methods will probably ultimately elucidate the etiology in cases which at present appear unfathomable. Association of a group of men, as advocated by Meaker, will much facilitate a combined study of both the husband and wife. The recommendation for such a group study need not necessarily be made at the beginning of treatment as in many cases the simpler methods of examination and treatment will be sufficient or will show the hopelessness of the situation. When conception is found to be possible but the first plan treatment is of no avail, then further intensive studies can be made.

One must not forget the age of the contracting parties and its influence on both absolute and relative sterility.

The fertility index of both husband and wife has a distinct bearing on the fruitfulness of their marriage. Many interesting examples of this have been shown by the matings of lower animals. A husband and wife each of low fertility may have no progeny and yet if they later marry a partner of high fertility conception may result. The important point in this connection is to find out what that particular influence is which results in high or low fertility index.

Most interest in a study of sterility attaches to those cases in which healthy semen is deposited upon the external os and in the vaginal vault, the tubes are patulous, there is no gross lesion and yet conception does not occur. Some of them must be due to an endocrine disturbance that results in a deficient production of healthy ova.

I cannot help feeling, also, that inasmuch as the endocrine system is so intimately bound up with the normal functioning of the reproductive organs, until we understand the interrelationship and function of the ductless glands and have more accurate methods of estimating the excessive or deficient activity of each, we can scarcely hope for more favorable results. The work of Frank and others makes us sanguine that our hopes in this direction will be satisfied. When that much has been done the therapeutic relief of such disorders may not be far distant.

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1827 SPRUCE STREET.

Meyer, P.: Pyelitis Gravidarum. Monatschrift f. Geburtsh. u. Gynäk. 75: 109, 1926.

He emphasizes the following facts: Pyelitis occurs most frequently in the seventh month of pregnancy and is much more frequent in primiparas. The right kidney is more often affected than the left during pregnancy but not in the non-pregnant state. Stasis of urine is a predisposing factor as evidenced by the relief obtained from ureteral catheterization. Bacteria gain access to the bladder from without and through the blood and lymph. Proximity to the intestines plays a rôle and the greater frequency of right-sided pyelitis is explained by the closeness of the ascending colon to the right kidney. Pyelitis gravidarum is nearly always a recrudescence of pyelitis which the woman had in childhood.

The symptoms of pyelitis are given in detail and the treatment is divided into four types: (1) medicinal and dietetic; (2) ureteral catheterization; (3) surgical, and (4) interruption of pregnancy.

J. P. GREENHILL.

V. FLUCTUATIONS IN BLOOD SUGAR DURING ECLAMPSIA: REPORT OF ADDITIONAL CASES*

BY PAUL TITUS, M.D., E. W. WILLETTS, M.D., AND H. D. LIGHTBODY, M.S.,
PITTSBURGH, PA.

(From the Department of Obstetrics and Gynecology, St. Margaret Memorial Hospital)

IN A PAPER read recently before the Brooklyn Gynecological Society, Stander and Harrison,¹ of the Johns Hopkins Hospital, question the validity and accuracy of those studies from our clinic which have been published under the heading of *Fluctuations in Blood Sugar During Eclampsia*.^{2, 3, 4, 5} They state that they disagree both with our findings and with our conclusions after having "studied the blood sugar at every possible time in relation to the eclamptic outbreak (before, during, and after)" and that contrary to our observations of sudden and wide fluctuations in blood-sugar values during eclampsia which we believe of profound etiologic significance, they find "in general the blood-sugar level remains fairly constant throughout the disease."

Without going into unnecessary details regarding our work against which their criticism is directed, it may be said that the conclusions of their paper are a direct refutation of ours and that their findings, if they stand, would discredit our work. For example, in speaking of our term "relative hypoglycemia" they say "as there is no relative hypoglycemia that condition cannot be utilized to explain the production of eclamptic convulsions, and these convulsions are not comparable to insulin hypoglycemic convulsions."

They do agree with us to the extent of saying that following convulsions there is a "slight" rise in blood sugar (in our cases this rise ranged from 15 mg. to as high as 105 mg. per 100 c.c. blood).

Our researches and conclusions are important⁶ only if correct, and our entire study should be able to stand the test of repetition by other research workers. If our laboratory and clinical observations are accurate, a duplication by others of the steps of our investigations might reasonably be expected to confirm our findings.

In this paper by Stander and Harrison, however, there is the situation of a pointed disagreement by serious workers with our own seriously conducted research. The inference is that they had carefully repeated our studies step by step and were prepared to present evidence which would warrant statements which they knew would be

*This paper is one of the series of studies of the toxemias of pregnancy being conducted by the John C. Oliver Memorial Research Foundation at the Laboratory of the St. Margaret Memorial Hospital.

immediately questioned. This is especially true since Stander in his monograph on *Toxemias of Pregnancy* had said shortly before regarding our work, "The author (Stander) has attempted to corroborate the findings of Titus, by studying the blood sugar at five minute intervals in 8 eclamptic patients. The final results will be reported elsewhere, but it may be stated that he was unable to observe a relative hypoglycemia in any of them."

With this present paper they present eight charts, presumably the cases referred to above, representing 9 different eclamptic seizures (2 in one woman). It is on these charts that they base their opinion as to the incorrectness of our views, although a survey

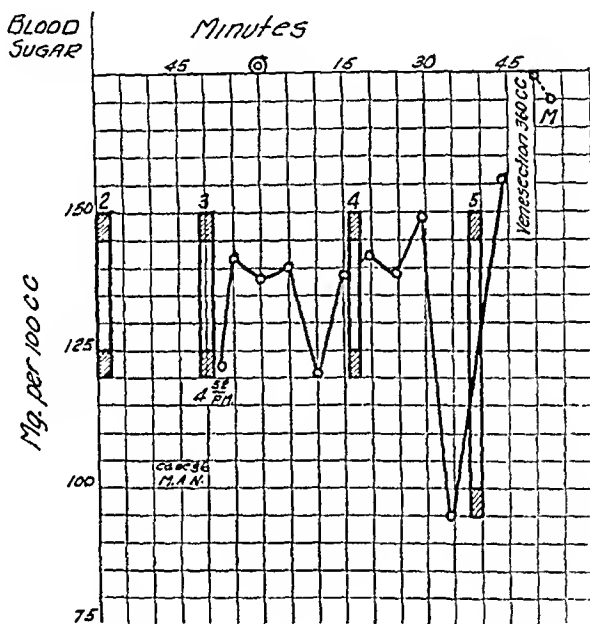


Chart I.—Blood-sugar curve during eclampsia. Vertical bars indicates convulsions, numeral being consecutive number, and L indicating last convulsion of eclamptic attack. M indicates beginning of medication (morphine and intravenous dextrose).

Eclampsia Case No. 36. Initial level 122 mg., highest level (before venesection) 156 mg., lowest level 95 mg. sugar per 100 c.c. blood. Variation range, 41 mg.

Glycemia curve demonstrates following points: (1) marked fluctuation in blood sugar in short intervals of time during eclampsia, (2) fall in blood sugar preceding eclamptic convulsions (4th and 5th), and (3) compensatory or physiologic rise in blood sugar following convulsions (3rd, 4th, and 5th). Patient had sixth and last convulsion at 6:05 P. M. (not shown in chart).

of these charts discloses that they have formed their conclusions about our studies without having repeated our work. We state again that our opinions were based on cases of eclampsia in which our studies consisted of a prolonged and tedious series of blood-sugar readings at intervals of five or at the most ten minutes apart during which time no medication of any description was given. In our second paper on this subject³ we even charted certain of our cases which were inconclusive because longer intervals had been allowed to elapse, and we

pointed out our mistakes in this respect, so that similar errors need not be made by others.

In 6 of these 9 blood-sugar curves on which Stander and Harrison establish their disagreement with us and in which they found no such fluctuations as we had described, the blood specimens for their sugar determinations were not taken at our short intervals, despite the statement in Stander's book referred to above, but ranged from *thirty or forty minutes to twenty-four hours apart*. Moreover certain of these patients were given insulin and dextrose injections during the time of their study by Stander and Harrison.

Two of the remaining 3 cases are obviously inconclusive, although in these they state that they had realized the need for more frequent readings. These 2 cases give practically no data or information regarding the behavior of the curves in that important period preceding the convulsion, because the "series" here consists of only two readings

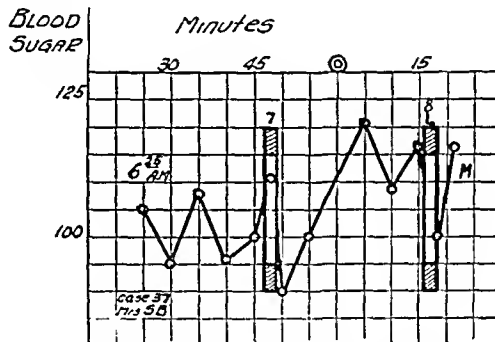


Chart II.—Blood sugar curve during eclampsia. Same symbols as in Chart I.

Eclampsia Case No. 40. Initial level 111 mg., highest level 177 mg., lowest level 90 mg. sugar per 100 c.c. blood. Variation range 31 mg.

Glycemia curve demonstrates (1) fluctuation during eclampsia, (2) falls in blood sugar preceding convulsions (7th and 8th), and (3) rise in blood sugar following convulsions.

a few minutes before the convulsion with nothing shown as to the earlier or preceding values with which to compare these two readings. Their conclusion (p. 21) from one of these was that this "shows that it (the blood sugar) remained almost constantly at 115 mg. before the fourth convulsion," although the term "almost constantly" is represented by only two readings, the first at six minutes before and the second at one minute before the convulsion, with nothing charted about any possible earlier values.

The final case which is the only one to resemble our studies has four readings in the seventeen minutes preceding the convulsion, and it is significant that this curve does show a fall in blood sugar of 7 mg. within ten minutes time directly before the convulsion. Stander and Harrison explain this by suggesting that "this is not much greater than the experimental error inherent to all colorimetric methods."

Our comment on this is, it is an extraordinary coincidence that this suggested error comes at the very point where we claim it is almost characteristic to find similar or greater falls in blood sugar during eclampsia, namely, just before the convulsion. It is more than a coincidence that this occurs in the solitary case which they studied according to our standards. We suggest, moreover, that a variation of 7 mg. is a very considerable error for the latest method of Benedict, which they used; and that this represents or is the equivalent of a considerably greater fall than 7 mg. on the scale of the older Folin-Wu method which we employed.

Assuredly this one case warrants anything but such a disagreement as has taken place; and the other 8 cases are inconclusive because they do not duplicate or, for the most part, even resemble our work.

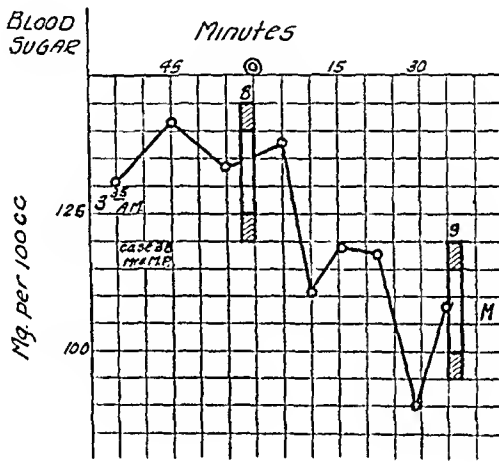


Chart III.—Blood-sugar curve during eclampsia. Same symbols as in Chart I. Eclampsia Case No. 38. Initial level 131 mg., highest level 142 mg., lowest level 90 mg. sugar per 100 c.c. blood. Variation range 41 mg. Glycemia curve demonstrates (1) fluctuations during eclampsia, and (2) fall in sugar preceding convulsions, especially marked before ninth.

Laferty, Nark and Sweeney,⁵ of Philadelphia, have reported corroborative evidence of the occurrence of wide fluctuations in blood sugar in eclampsia even with comparatively infrequent readings, while Bernardi,⁹ of Naples, Italy, has recently published a communication under the title of *Oscillations in Blood Sugar During Eclampsia*. In this he shows variations, although his intervals, too, are long; but his work will be referred to again presently in another connection.

REPORT OF ADDITIONAL CASES SHOWING FLUCTUATIONS

We now desire to present 7 additional cases which corroborate our earlier findings. Three of these were included in a paper which appeared in the *AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY*⁴ simultaneously with that of Stander and Harrison.

In that paper we showed the whole blood-sugar curves in conjunction with the plasma and the corpuscular sugar curves, but these latter have now been deleted for the purposes of this discussion. At this time we noted that a sudden cytoglycopenia or glucose impoverishment within the erythrocytes indicated by profound falls in corpuscular sugar is the outstanding feature of these periods of relative hypoglycemia which are associated with the convulsions. These cases together with the previously unpublished cases and those presented in our earlier communications³ make a total series of 19 eclampsia studies supporting our contentions regarding the presence of fluctuations in blood sugar and their possible significance during this disease.

These additional cases strengthen our earlier opinions and conclusions; and, because our findings are so consistent, we can only believe that Stander and Harrison failed to understand the necessity for the frequent readings which we now emphasize again. This would ac-

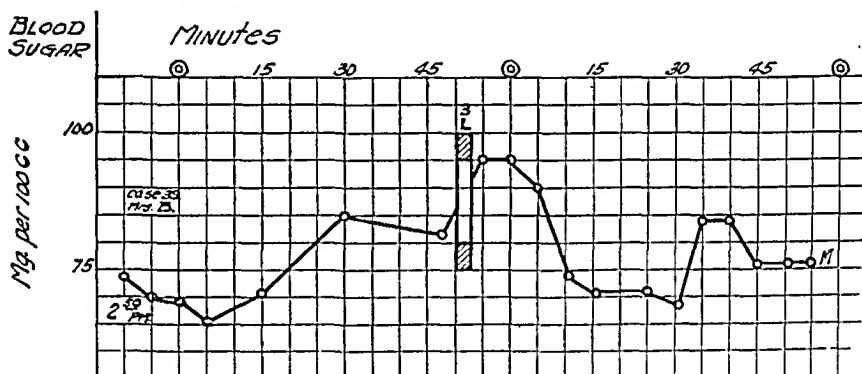


Chart IV.—Blood-sugar curve during eclampsia. Same symbols as in Chart I.

Eclampsia Case No. 39. Initial level 74 mg., highest level 95 mg., lowest level 65 mg. sugar per 100 c.c. blood. Variation range 30 mg.

Glycemia curve demonstrates (1) fluctuation in blood sugar during eclampsia, (2) compensatory rise following convulsion. Data are incomplete preceding convulsion. Specimens were being taken at long intervals (15 minutes apart), because patient seemed to be improving. Convulsion came as clinical surprise. As shown in our previous study of this case (see Ref. 4, Chart II), a striking fall in corpuscular sugar was occurring during this interval and through the time of the convulsion.

count for their failure to duplicate the steps of our work while attempting to adjudge it. It is our earnest hope that not only they but also others may feel inclined to undertake such studies in order that our contentions, if of any importance in the eventual elucidation of eclampsia, may be fairly and judiciously evaluated by others than ourselves.

RELATIVE HYPOGLYCEMIA

Surely the term "relative hypoglycemia" has been sufficiently explained in its connection with the occurrence of convulsions. Briefly, by this is meant a level of blood sugar which in relation to the levels shortly before is "relatively" hypoglycemic, while its value in actual figures need have no relation to average normal values. For example,

hypoglycemic reactions from insulin occurring at blood-sugar values of more than 200 mg. have been shown by John.¹⁰

In our glycemia curves we frequently note sudden and fairly wide falls which are not followed by convulsions. This means only that not all drops in blood sugar are succeeded by convulsions, even though we believe all convulsions that do occur are preceded by these drops. Consequently, the observation of Stander and Harrison of one such suddenly lowered level which failed to result in a convulsion, or even their artificial production of lowered levels in eclamptics by administration of insulin, especially when guarded with dextrose, still fails to nullify the existing ideas regarding the relationship between relative hypoglycemia and the convulsions of eclampsia.

AVERAGE BLOOD-SUGAR VALUES IN ECLAMPSIA

We wish finally to discuss briefly the matter of average blood-sugar values during eclampsia. Stander has frequently stated and repeats here that hypervalues are the rule, whereas Levy,¹¹ of New Orleans, finds

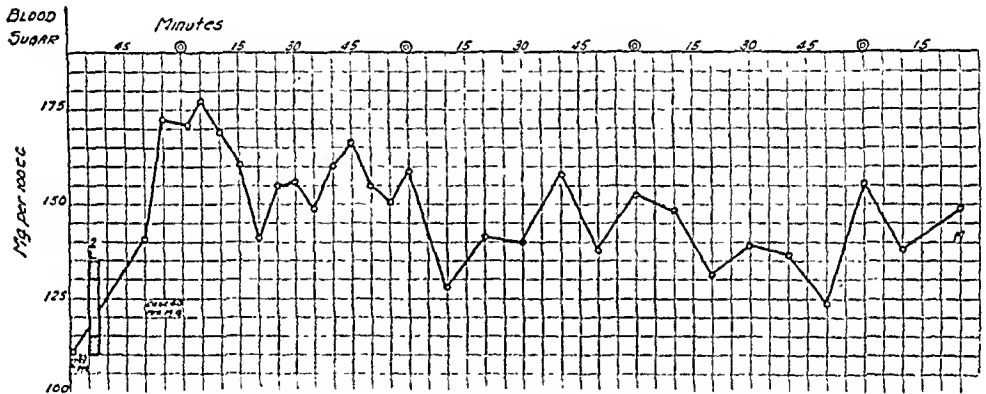


Chart V. Blood-sugar curve during eclampsia. Same symbols as in Chart I.

Eclampsia Case No. 40. Initial level 111 mg., highest level 177 mg., lowest level 111 mg. sugar per 100 c.c. blood. Variation range 66 mg.

Glycemia curve demonstrates (1) marked fluctuations during eclampsia, and (2) rise in blood sugar following convulsion.

Data regarding period preceding convulsion are lacking, because only one specimen of blood was obtained before second and last convulsions.

more hypovalues than hyperlevels. Stander and Harrison quote that Obata and Hayashi¹² have found hyperglycemia in eclampsia, but what these writers actually said is that blood-sugar levels in eclamptics approximate those of normal women, although certain of their cases showed some increase.* Furthermore, we find that Obata and Hayashi quote both Bergsma and Moritani as having been unable to find any difference between the blood-sugar levels in normal women and eclamptics. Widen is also cited by Stander and Harrison as corroborating their views in regard to hyperglycemia in eclampsia, but, as a matter of fact, a perusal of his paper¹³ discloses that he speaks of

*Der Blutzuckergehalt bei Eklampstikerinnen ist meist dem der Gesunden. . . . in einigen Fällen aber bedeutend vermehrt. (P. 96.)

this as being an "intermittent hyperglycemia," rather than a constant tendency to high levels.

None of our group recall having claimed, as we were quoted, "that hypoglycemia is characteristic of eclampsia," although we do believe this, but rather we have said³ that our findings indicate "that hyperglycemia is not as constant a feature of eclampsia as was commonly assumed" and later that "contrary to the usual opinions we found normal and lower than normal values predominating." We, too,

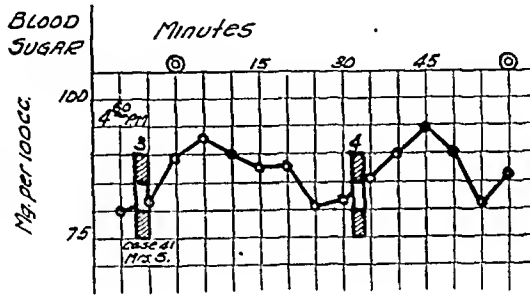


Chart VI.—Blood-sugar curve during eclampsia. Same symbols as in Chart I.

Eclampsia Case No. 41. Initial level 80 mg., highest level 94 mg., lowest level 80 mg. sugar per 100 c.c. blood. Variation range 14 mg.

Glycemia curve demonstrates (1) fluctuation in blood sugar during eclampsia, (2) fall preceding a convulsion (4th), and (3) rise following convulsions (3rd and 4th). Patient had three more convulsions not appearing in charts; one at 6:20, one at 7:05 and one at 7:55 P. M.

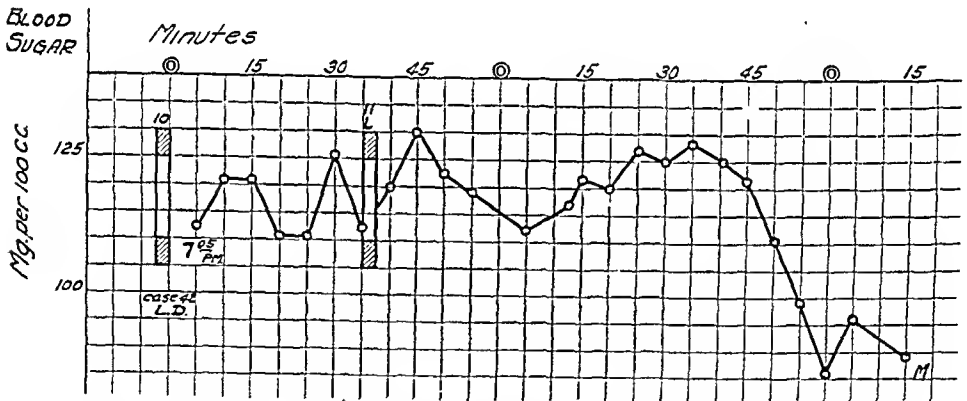


Chart VII.—Blood-sugar curve during eclampsia. Same symbols as in Chart I.

Eclampsia Case No. 42. Initial level 113 mg., highest level 130 mg., lowest level 86 mg., sugar per 100 c.c. blood. Variation range 44 mg.

Glycemia curve demonstrates (1) fluctuation in blood sugar, (2) fall preceding a convulsion (11th and last), and (3) rise following both tenth and eleventh convulsions. Medication was begun at about the time when, according to blood-sugar curve as subsequently developed, further convulsions might have been expected.

found higher values in a few of our cases, and we report our figures in detail in the accompanying table. It is apparent, therefore, that there are enough misquotations of the work of others, or possibly misinterpretations in translation, involved in the opinions which these two authors have formed and stated so emphatically, that these opinions are thus laid open to question on this ground also.

TABLE I. ECLAMPSIA: BLOOD SUGAR ON ADMISSION
(Showing Predominance of Normal and Lower Than Normal Values over Hyperlevels)

SERIES NO.	CASE SYMBOL	BLOOD SUGAR VALUES AND GROUPING*		
		HYPO-BELOW 80	NORMAL 80 TO 110	HYPER-ABOVE 110
1	20-H			143
2	21-M		104	
3	22-M		87	114
4	23-B			140
5	24-M		105	
6	25-A	77		
7	26-J		84	
8	27-B		103	
9	28-C			
<i>Cases 1 to 9 incl. reported by Titus and Givens, J. A. M. A. 78: 92, Jan. 14, 1922.</i>				
10	7143			168
11	189	55		
12	1365	76		
13	601			116
14	1769		101	
15	3302			232
16	3922			133
17	7004		85	
18	5494	50		
19	E. R.	61		
20	M. S.		83	
21	F. B.			121
22	M. C.			123
<i>Cases 10 to 22 incl. previously unreported.</i>				
23	MM Chart 7			200
24	MP Chart 6		83	
25	KM Chart 4	55		
26	DII Chart 3		89	
27	TM Chart 7			137
28	ER Chart 6		105	
29	MK Chart 2			200
30	MN Chart 5		100	
31	BS Chart 7		90	
32	MJ Chart 8		83	
33	FW Chart 3			123
34	MP Chart 8		110	
35	EW Chart 8		100	
<i>Cases 23 to 35 incl. reported by Titus, Dodds and Willetts, AM. J. OBST. & GYNEC. 15: 303, March, 1928.</i>				
36	M. A. N.			122
37	S. B.		105	
38	M. P.			131
39	M. B.	74		
40	M. G.			111
41	M. S.		80	
42	L. D.			113
<i>Cases 36 to 42 incl. shown in charts of present paper.</i>				
Totals:		7	18	
42		25		17

These blood-sugar values were determined by the Folin-Wu method. Normal values by this method are usually considered as being between 90 and 120 mg. per 100 c.c. blood (vide ref. 14). In order to avoid any possible bias in evaluating and grouping our cases we prefer to accept the ten point disadvantage which occurs when we lower (by viewing 80 to 110 mg. as normal) the minimum level of hypervalues to 110 and the upper level of hypovalues to 80. The groupings in this table would be even more strikingly convincing had we taken our full authoritative allowance in this respect.

According to innumerable authorities of whom we shall quote only Hawk and Bergeine,¹⁴ normal blood-sugar values for the Folin-Wu method, which we used, may be regarded as between 90 and 120 mg. per 100 c.c. and for Folin's later modification between 80 and 110 mg. We accept these lower values for classification of our cases and even with the disadvantage of ten full points are able to prove our claims of the predominance of normal and low levels in eclampsia.

In our total series of 42 eclamptics reported herewith there are 25 cases in the groups of normal or lower than normal values as compared with 17 in the high group, so that these former are seen to outnumber the hypervalues in a ratio of approximately 1.5 cases to 1.

Bernardi⁹ finds hypovalues a frequent occurrence in eclampsia, commenting as we have that the muscular activity of the convulsive seizures tends to act against these low values toward higher levels. Using the method of Hagedorn and Jensen for blood sugar in a study of 16 eclamptics, he says, "To talk of an elevation of the rate of glycemia in eclampsia is absurd. Having computed many determinations in this regard, I have seen the absolute percentage values of the glucose in the blood lowered." He refers to Scontrini who found in 7 eclamptics an average of 78 mg. sugar per 100 c.c. blood (method not stated).

The obvious conclusion from this is, not that Stander and his associates are entirely wrong in their belief that a hyperglycemia is frequently to be seen in eclampsia, but rather as we have repeatedly said, that lowered levels are more characteristic with a definite tendency for the hypovalues to be obscured by the physiologic and temporary hyperglycemia which follows any strenuous muscular exertion. Thus an investigator disregarding this well-known phenomenon might readily be misled in his conclusions.

Work now under way in this clinic but still incomplete indicates that hypoglycemia is much more pronounced and is an even more constant feature of preeclampsia than it is after the sugar values have been disturbed by convulsions.

It is not necessary to repeat here the details of our laboratory work in order to indicate that suitable precautions have been taken to avoid technical errors. These details have been carefully outlined in our previous publications.

CONCLUSIONS

1. Seven additional serial blood-sugar curves during as many new cases of eclampsia serve further to confirm our earlier contentions that there is a wide fluctuation in blood sugar in exceedingly short intervals of time during an eclamptic seizure. These with our previously published cases make a total of 19 eclamptics that have been thus studied.

2. These cases show, as did the others, that it is characteristic for the convulsions to be preceded by sharp falls in blood sugar; periods of what we have previously termed "relative hypoglycemia."

3. Further work in our clinic has indicated that a sudden cytglycopenia or glucose impoverishment within the erythrocytes is the outstanding feature of this period.

4. In a series of 42 cases of eclampsia presented herewith an analysis of single blood-sugar values taken from each case shortly after admission and before treatment demonstrates that, while hyperlevels are to be seen in a minority percentage of instances, those cases showing normal or lower than normal values outnumber the ones with hyperlevels in a ratio of 1.5 to 1.

5. Work now under way in this clinic indicates that hypoglycemic levels are a predominant and fairly constant feature of true pre-eclampsia.

6. We still consider that in these respects the intravenous administration of dextrose is specific treatment for eclampsia and preeclampsia, while the addition of insulin or its use alone is not indicated.

7. A study of the charts in the recent criticism of our work by Stander and Harrison shows that these investigators did not duplicate our work so that their failure to corroborate our findings in no way invalidates our previous as well as our present conclusions. This is especially true in view of the additional series of confirmatory cases published herewith.

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1015 HIGHLAND BLDG.

THE ACID-BASE EQUILIBRIUM OF THE BLOOD IN THE LATE TOXEMIAS OF PREGNANCY

BY H. J. STANDER, M.D., N. J. EASTMAN, M.D., AND
E. P. H. HARRISON, JR., M.D., BALTIMORE, Md.

(From the Department of Obstetrics, Johns Hopkins University and Hospital.)

AMONG the many metabolic changes accompanying normal gestation, there is perhaps none more striking than the reduction in alkaline reserve, as evidenced by a lowered alveolar carbon dioxide tension, and a plasma or serum carbon dioxide combining power below normal limits. As first shown by Hasselbalch and Lundsgaard,¹ the alveolar CO₂ tension during the latter stages of pregnancy is from 30 to 35 mm. Hg, a reduction of about 10 mm. from the normal. According to Hasselbalch and Gammeltoft,² this lowering of the alveolar CO₂ tension manifests itself as early as the second month of pregnancy. The CO₂ combining power of the plasma or serum is similarly decreased, as was shown by Losee and van Slyke,³ Mahnert,⁴ Killian and Sherwin,⁵ Rowe,⁶ Marrack and Boone,⁷ Williamson,⁸ Cook and Osman,⁹ Stander,¹⁰ and others. In view of these observations, it has been customary to speak of the "acidosis of pregnancy," although it has never been established whether this lowered alkaline reserve of the blood is due to an accumulation of acid or to a reduction of fixed base or a combination of both factors. It was not until the present year that Oard and Peters,¹¹ clearly showed that normal pregnancy is not accompanied by a collection of abnormal acid, but on the contrary by a diminution of fixed base.

The reduction in alkali reserve of the blood in pregnancy may be a factor in the production, or in the course, of certain of the toxemias of pregnancy. It has been shown by many workers that eclampsia is often associated with a marked reduction in the CO₂ combining power of the blood. In view of such observations, it seemed essential that a complete electrolyte study should be made, and this paper presents such a study in normal nonpregnant and pregnant women, as well as in women suffering from the various toxemias of late pregnancy.

METHODS

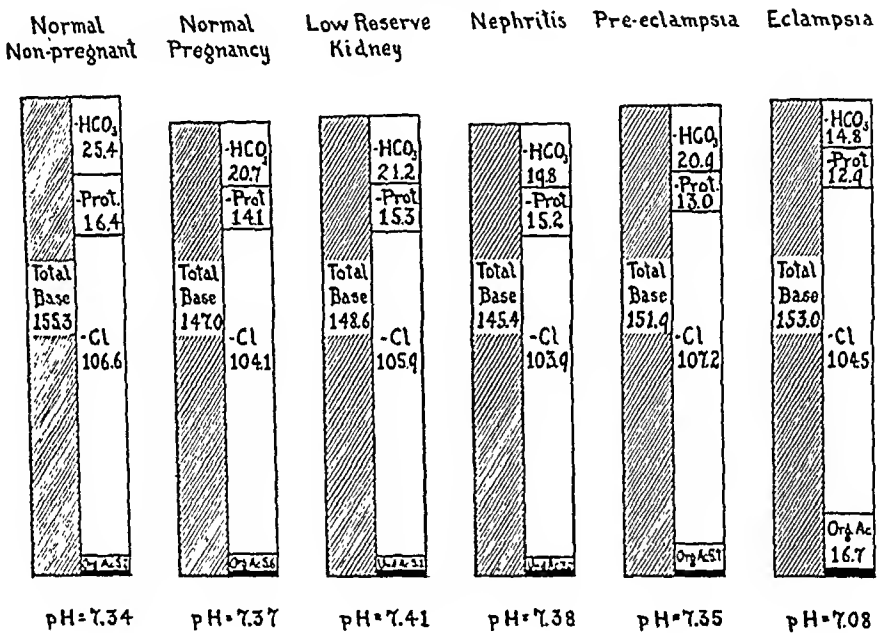
The method of collecting blood specimens and the analytical procedures employed are the same as those described in our recent paper in the *Journal of Biological Chemistry*.¹² Serum proteins, CO₂ content, serum chlorides, inorganic phosphorus and sulphur were converted into milli-equivalents per liter by the formulas as outlined in that paper. Organic acids and hydrogen-ion concentration were determined electrometrically.

The total acid is calculated as follows: $T.A. = BP + BHCO_3 + BCl + BPO_4 + BSO_4 + O.A.$, where T.A. represents the total base-combining power of the inorganic acids and of the serum protein; BP, $BHCO_3$, BCl, BPO_4 , BSO_4 , the base combined with protein, carbon dioxide, chlorides, inorganic phosphorus and inorganic sulphur, respectively; and O.A., the organic acids in the serum. All these values, as well as total base, are expressed as milli-equivalents. The P_{Hx} readings are corrected to 38° C.

RESULTS

In Table I are given the average values obtained for normal non-pregnant young women, for normal pregnant women, as well as for several patients suffering from low reserve kidney and nephritis com-

CHART I.



plicating pregnancy. In this paper, we have employed the classification of the toxemias of pregnancy used in this clinic.¹³

Table II represents the findings in one case of severe preeclampsia and in five cases of eclampsia. In the eclamptic women, complete acid-base studies were made while the patients were severely ill and having frequent convulsions, as well as during their convalescence, except in the one fatal case, where we obtained a second blood specimen about eighteen hours before death. The electrolyte changes throughout the course of eclampsia are clearly depicted in this table.

In Chart 1, we have endeavored to show by means of columns the relative quantities of total base and total acid in the different conditions under consideration. At the base of the anion column appears a solid black line of varying thickness in the different conditions, representing the relative amounts of $BPO_4 + BSO_4$. This manner of rep-

TABLE I*

CASE NO.	DIAGNOSIS	N.P.N.	PROTEINS	B.P.	CO ₂	BHCO ₃	NaCl	BCl	PHOSPHORUS	BPO ₄	SULPHUR	BSO ₄	ORGANIC ACIDS	TOTAL ACID	TOTAL BASE	pH	REMARKS
Average	Nonpregnant	25.8	7.0	16.4	60.2	25.4	624	106.6	2.2	1.3	0.8	0.5	5.2	150.2	155.3	7.34	Reported in J. B. Chem. 1929
Average	Normal pregnancy	24.9	6.1	14.1	48.8	20.7	608	104.1	1.9	1.1	0.8	0.5	5.6	146.1	147.0	7.37	Reported in J. B. Chem. 1929
22731	Low reserve kidney	19.3	6.9	16.2	50.6	21.4	625	107.0	2.5	1.5	0.7	0.4		146.1*	149.0	(7.35)	B.P. 150/110 Alb. = 1 gm. liter
23469	Low reserve kidney	24.0	6.8	16.5	49.2	21.0	613	104.8	1.6	0.9	0.7	0.4		143.5*	148.0	7.41	B.P. 153/108 Alb. = trace
20508	Low reserve kidney	27.8	5.6	13.3	47.8	20.2	620	106.0	2.5	1.5	0.9	0.5		140.9*	148.8	(7.35)	B.P. 160/105 Alb. = 1 gm. liter
Average	Low reserve kidney	23.7	6.4	15.3	49.2	21.2	619	105.9	2.2	1.3	0.8	0.5		143.5*	148.6	7.41	
-3012	Nephritis	18.7	6.8	16.0	48.8	20.6	615	105.0	2.3	1.3	0.8	0.5		142.9*	142.9	(7.35)	B. P. 180/110 Alb. = trace
10795	Nephritis	30.0	5.7	13.9	46.1	19.6	612	104.7	1.8	1.0	1.1	0.7		146.4*	152.6	7.40	B.P. 270/170 Alb. = 8 gm. liter
22549	Nephritis	37.5	6.7	15.8	45.4	19.1	595	101.9	1.9	1.1				137.9*	140.7	7.35	B.P. 170/130 Alb. = 2 gm. liter
Average	Nephritis	28.7	6.4	15.2	46.8	19.8	607	103.9	2.0	1.1	0.9	0.6		142.4*	145.4	7.38	

*Organic acids not included.

TABLE II

CASE NO.	DIAGNOSIS	DATE	M.P.K.	PROTEINS	B.P.	CO ₂	BHCO ₃	NaCl	BCl	PHOSPHORUS	BPO ₄	SULPHUR	BSO ₄	ORGANIC ACIDS	TOTAL ACID	TOTAL BASE	PH	REMARKS
24617	Preeclampsia		27.3	5.5	13.0	49.5	20.9	627	107.2	1.9	1.1	0.8	0.5	8.7	151.4	151.9	7.35	14 days A.P. B.P. 185/125 Alb. = 5 gm. liter
23309	Eclampsia	3/9/29	61.8	5.3	10.2	29.1	11.5	631	107.9	2.1	1.2	1.3	1.0	18.0	149.7	151.3	6.99	45 sec. after fourth convulsion
		3/10/29	55.9	4.8	11.1	39.2	16.6	569	97.3	2.4	1.4			8.7	135.0	137.1	7.34	No convulsions for 12 hours
		3/11/29	61.8	4.7	10.6	42.3	17.6	548	93.9	2.4	1.4	1.0	0.6		124.1*	136.6	7.25	Improved
		3/19/29	23.4	4.9	11.4	57.3	24.2	632	108.1	2.4	1.4	0.8	0.5	7.9	153.5	155.6	7.33	Recovered
23925	Eclampsia	3/29/29	33.3	6.8	14.3	35.6	14.4	621	106.2	1.9	1.1	0.9	0.5	14.5	151.0	154.6	7.07	30 sec. after fourth con- vulsion
		3/30/29	66.6	5.6	12.7	33.6	14.2	662	113.2	2.2	1.3	0.9	0.5	14.3	156.2	156.8		18 hours before death
23222	Eclampsia	6/12/29	25.0	6.4	13.4	42.7	17.5	597	102.0	2.8	1.7			20.5	155.1	153.8	7.13	½ hour after fourth convulsion
		6/14/29	37.0	6.1	13.7	56.6	23.6	640	109.4	1.7	1.0			10.8	158.5	158.2	7.23	Improved
		6/26/29	27.0	6.7	14.1	63.2	26.6	599	102.5	1.7	1.0			13.0	157.2	158.5	7.30	Recovered
26393	Eclampsia	8/17/29	32.1	6.9	13.6	40.2	15.9	596	101.9	2.8	1.7	1.0	0.6	13.7	147.4	153.4	6.98	5 minutes after tenth convulsion
		9/3/29	22.7	7.3	17.0	53.7	22.5	551	94.2	2.3	1.3	0.7	0.4	13.0	148.4	151.6	7.32	Recovered

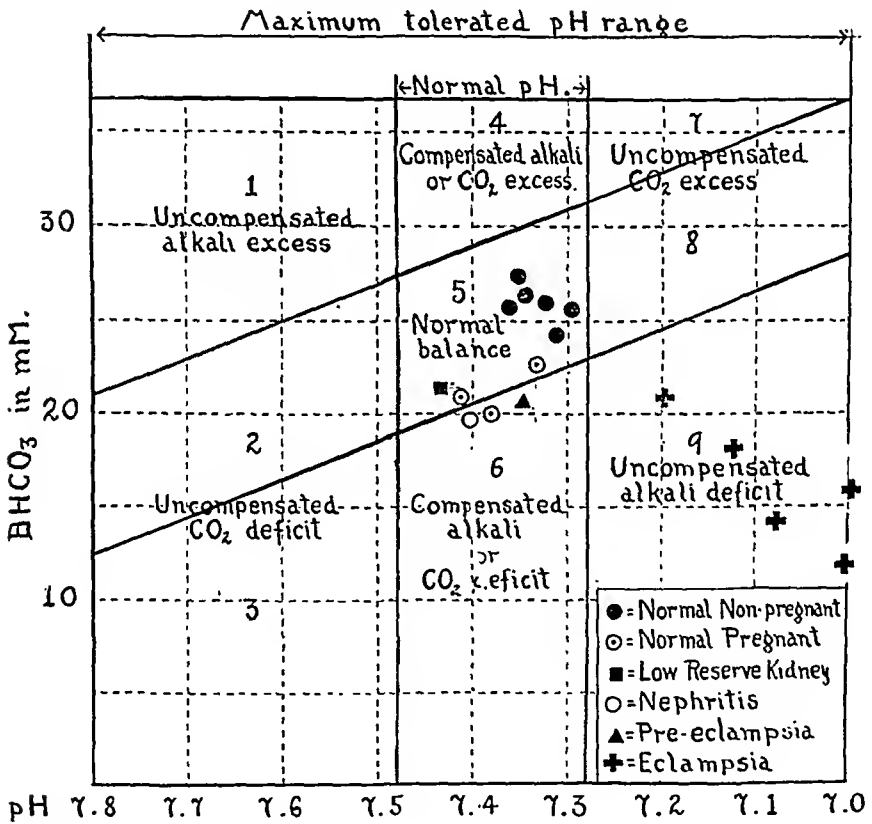
*Organic acids not included.

resentation is used because of the relatively small quantities of these two anions. All of the cases studied are further plotted in Chart 2, which is an adaptation of the graph of van Slyke,²⁴ showing the nine areas representing normal acid-base balance, as well as conditions of acid or alkali excess or deficit, which are either compensated (normal P_H) or uncompensated (abnormal P_H).

DISCUSSION

Normal Pregnancy.—From the values shown in Table I, it is clear that normal pregnancy is not associated with an increase or accumula-

CHART II.



tion of acids in the blood. On the other hand, there is a definite reduction in alkali reserve, but this is associated with a decrease in total base. In view of the constancy of concentration of acid and base radicals in the normal human blood, it is very remarkable, as pointed out by Oard and Peters, that the pregnant woman can tolerate a reduction of about 5 per cent of total base, and a similar reduction of the anions in the blood serum. Further work is necessary before one can venture to explain the cause of this striking departure from the normal, and it is possible that it may have a very funda-

mental bearing upon certain of the chemical changes which are always associated with normal gestation.

The P_H remains strictly within normal limits during normal pregnancy, yet due to the decreased serum bicarbonate ($BHCO_3$), we note that the values for normal pregnancy, as shown in Chart 2, tend to fall toward the "compensated alkali or CO_2 deficit" area. The decreased $BHCO_3$ is balanced by a proportionate fall in the other constituents, and so the P_H remains normal. This is clearly shown in Chart 1.

Low Reserve Kidney.—The findings in low reserve kidney are very similar to those in normal pregnancy. The average value for total base in this type of toxemia is 148.6, as compared with 147.0 mm. in normal pregnancy. Furthermore, there is a similar reduction in serum proteins and bicarbonate. From a study of Table I, as well as from Charts 1 and 2, it is clear that the electrolyte changes observed in normal pregnancy are likewise present in low reserve kidney. The P_H in this type of toxemia averages 7.41, a figure within normal limits.

Nephritis.—The cases of nephritis complicating pregnancy, as reported in Table I, were fairly severe, although none of them showed marked nitrogenous retention nor any symptoms suggestive of actual uremia. The acid-base equilibrium in these cases is not markedly disturbed. Indeed, in them the conditions are similar to those accompanying normal pregnancy. As yet we have not been able to study the serum electrolytes in a case of nephritis complicating pregnancy with nitrogenous retention and evidence of an impending uremia.

Eclampsia.—The most striking results of this study are to be seen in five cases of eclampsia. These patients were studied while severely sick and in coma, as well as during their convalescence. The most outstanding finding is the very low P_H observed at the time of convulsions. This is true for all five patients. In four of them, the P_H of the blood rose to within normal limits as clinical improvement occurred. Furthermore, each case showed a marked reduction in bicarbonate and an increase in organic acids. As shown in Chart 1, all our eclamptic patients fall in area 9, which represents an uncompensated alkali deficit. In other words, these patients had true acidosis. As they improved, the acidosis disappeared. One of the five patients died, and in her case on two occasions we found a marked reduction in $BHCO_3$ and an increase in organic acids. Unfortunately, we were able to get only one P_H reading on her blood, and this showed a value definitely below normal limits.

As it is apparent from the above study that severely ill patients having eclamptic convulsions are suffering from a marked disturbance in the acid-base equilibrium, as is manifested by a reduction in bicarbonate, an increase in organic acids and a dangerously low P_H , it does not seem advisable that such patients should be subjected to gen-

eral anesthesia, as we know that in general anesthesia the acid-base balance is so disturbed as to result in an acidosis. The work of Ronzoni, Koechig and Eaton,¹⁵ indicates that the acidosis of ether anesthesia may in large part be brought about by an excess of lactic acid, instead of the acidosis being the cause of the lactic acid accumulation, as suggested by Anrep and Cannan.¹⁶ We know, further, that inhalation anesthesia results in an increased collection of lactic acid in the blood stream, due probably to the asphyxia or anoxemia accompanying the anesthesia. Koehler, Brunquist and Loevenhart,¹⁷ produced a rapid uncompensated alkali deficit by means of anoxemia. Whatever may be the direct cause of the acidosis, it is well established that such a disturbed acid-base balance accompanies deep general anesthesia. This, then, is further proof that in the treatment of eclampsia, as has already been pointed out by one of us, the use of general anesthesia is strongly contraindicated.

The fetal mortality in eclampsia is very high, being about 40 per cent in the registration area of the United States. It is quite conceivable that the true acidosis of eclampsia may be a factor in the production of this high mortality.

In Table II, we report one case of severe preeclampsia. This patient had a blood pressure of 185 systolic and 125 diastolic, and 5 gm. of albumin per liter of urine, two weeks before delivery. At this time electrolyte studies on her serum revealed an acid-base balance quite similar to that seen in normal pregnancy, although total acetone bodies had accumulated to the extent of 82.7 mg. per liter of blood, which was further accompanied by a marked increase in the organic acids,¹² in the urine. If one may venture to draw conclusions from a single case, it appears that the marked acidosis of eclampsia appears only during the convulsions or shortly thereafter, and that it therefore is a sequel to rather than a cause of the disease. However, we are conducting further experiments in the hope of elucidating this problem, as it is essential to discover the mode of production of the eclamptic acidosis here described. We have reported¹² a similar increase in organic acids in the urine in eclampsia.

TREATMENT OF ECLAMPSIA

Considering the rapid clinical course of many fatal cases of eclampsia together with our observations on the acid-base equilibrium of eclamptic patients, it seems to us safe to infer that many eclamptic patients die from an uncompensated acidosis due to an alkali deficit. The present study confirms our previous ideas based on CO₂ combining power determinations. Furthermore, it appears logical to assume that at least a certain number of such eclamptic patients may be saved by the use of antiaacidosis treatment, and in view of the severe alkali deficit, it would seem advisable to employ bicarbonate treatment. Up to the

present time we have felt that insulin therapy was sufficient to counteract the low CO_2 combining power of the blood, so often observed in severe eclampsia; but the present study has demonstrated so clearly the existence of an "uncompensated alkali deficit" acidosis without any marked increase in ketone bodies, that although insulin may be of help in certain cases, it seems advisable to employ more rigorous treatment when the P_{H} of the blood is at a dangerously low level. For these reasons, we are starting to treat such patients with sodium bicarbonate intravenously when necessary, and we hope that the results obtained will fulfill our theoretic expectations. The lowering of H_2CO_3 by deepened breathing as well as the excretion of acid metabolites through the kidneys, may be seriously interfered with in the eclamptic patient in coma; in other words, the usual mechanisms of the body for preventing acid accumulation and P_{H} decrease are insufficient. Wilson¹⁸ reported fourteen cases of eclampsia treated with 3 to 5 per cent solution of sodium bicarbonate, and in amounts ranging from 6 to 40 gm. of the salt, intravenously. His protocols reveal marked increase in CO_2 combining power following such therapy.

It must be pointed out, however, that the use of sodium bicarbonate without control by laboratory observations, is not without danger. An overdose may lead to an alkalosis, a condition which is as dangerous as an uncompensated acidosis. Where it is impossible to accurately follow the P_{H} of the blood, the CO_2 combining power of the serum gives us an index of the acid-base equilibrium. Repeated studies at short intervals are necessary before the exact significance of the eclamptic acidosis can be determined. It is our present impression that in favorable cases at least, it is probably transitory and closely associated with the convulsions.

CONCLUSIONS

This paper is based upon total blood serum electrolyte studies in which the hydrogen-ion concentration and the organic acids were determined electrometrically, and seems to justify the following conclusions:

1. Normal gestation is accompanied by a reduction in total base, amounting to about 8 mm.
2. With this reduction in total base there is a decrease in the anions, serum protein and bicarbonate.
3. The "acidosis" of normal pregnancy, denoting an accumulation of abnormal acids, is a misnomer. It would be more correct to speak of a "compensated alkali deficit" of pregnancy.
4. Low reserve kidney and nephritic toxemia complicating pregnancy show the same changes in acid-base balance as normal pregnancy, except where the nephritis is severe enough to produce uremia.
5. Eclampsia, at the time of convulsions and coma is associated with

a true acidosis, due to an uncompensated alkali deficit, as demonstrated by a definite increase in the hydrogen-ion concentration.

6. This acidosis is probably not a causal factor, but rather should be regarded as a result of the eclamptic convulsion, and is sometimes severe enough to cause death by itself.

7. General anesthesia, because of the acidosis resulting from it, is contraindicated in the treatment of eclampsia, as it still further increases the acidosis due to the disease.

8. It is possible that the high fetal mortality in eclampsia may be in part due to the acidosis.

9. Insulin therapy is definitely of help in relieving the acidosis of eclampsia, but in view of the marked uncompensated alkali deficit observed in our cases, it may be advisable to attempt to treat the acidosis much more radically, as for example, by the intravenous administration of sodium bicarbonate.

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Ahumada: Cancer of the Breast and Pregnancy. *Semana Medica* 33: 567, 1926.

The author reports a case of cancer of the breast in a primigravida of 27 which despite prompt operation resulted fatally some two months after the birth of the child. This lesion always increases markedly in its rate of growth if pregnancy supervenes, and such a tumor appearing during pregnancy always grows rapidly with early local and general metastases and frequent recurrence if operated upon. Furthermore if one breast has been removed for cancer a subsequent pregnancy results in cancerous involvement of the second breast in 87 per cent of the cases. In this group the author recommends sterilization by means of the x-ray in order to avoid the danger inherent to a later pregnancy. From the standpoint of treatment every tumor of the breast during pregnancy should be considered malignant and treated as such. In the early months of pregnancy the uterus should always be emptied if a breast cancer is present, for advanced gestation this procedure is debatable.

THOMAS R. GOETHALS.

REVERSED GRADIENTS IN THE BOWEL OF PREGNANT ANIMALS*

BY WALTER C. ALVAREZ, M.D., AND KIYOSHI HOSOI, M.D.,
ROCHESTER, MINN.

(Division of Medicine, The Mayo Clinic)

MANY years ago, when one of us (Alvarez) first conceived the gradient theory of peristalsis, it promptly occurred to him that much of the nausea, vomiting, and heartburn of pregnancy might well be due to a reversal of one or more of the intestinal gradients. Such a reversal might conceivably be brought about by an increase in the metabolic rate and activity of the muscle in the lower part of the bowel, an increase related in some way to the increase in the metabolic activity of the pelvic organs.

As Hofbauer has shown, the stimulus of pregnancy leads not only to hypertrophy of the uterus but to hypertrophy of the muscle in the trigone of the bladder, in the lower end of the ureters, and in the vagina. It produces large changes in the blood supply of all the organs in the pelvis, and it alters their reactions to drugs and to stimulation of nerves. Such modifications in structure and function are to be expected from the work of Child, who has shown again and again that changes in the metabolic activity of one part of an organism will profoundly affect the growth and activity of adjacent parts.

In attempting to put these theories to a test one of us (Alvarez) years ago studied the gradients in rate of rhythmic contraction and in catalase content in a number of pregnant rabbits. So little difference from normal was found that the problem was put aside until more could be learned about some of the other gradients that were then being discovered in normal animals. Recently, when we succeeded in reversing the gradients of latent period and irritability by artificial stimulation of the muscle at the lower end of the ileum (by the injection of a few drops of turpentine), it occurred to us that these gradients might be reversed also by pregnancy, and an investigation was immediately started.

EXPERIMENTAL STUDY

With the help of the technic described in a number of recent papers (Alvarez and Hosoi) we have studied the behavior and physiologic properties of the bowel in 27 rabbits, representing about equally all stages of pregnancy. In addition there were 5 puerperal rabbits which had given birth to young from one to three days before they were

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studied, and a few pregnant and puerperal cats. The animals were anesthetized with urethan, 2 gm. for each kilogram of body weight being given by stomach tube. The spinal cord was pithed distal to the fourth dorsal vertebra, and the abdomen was opened in a bath of warm salt solution.

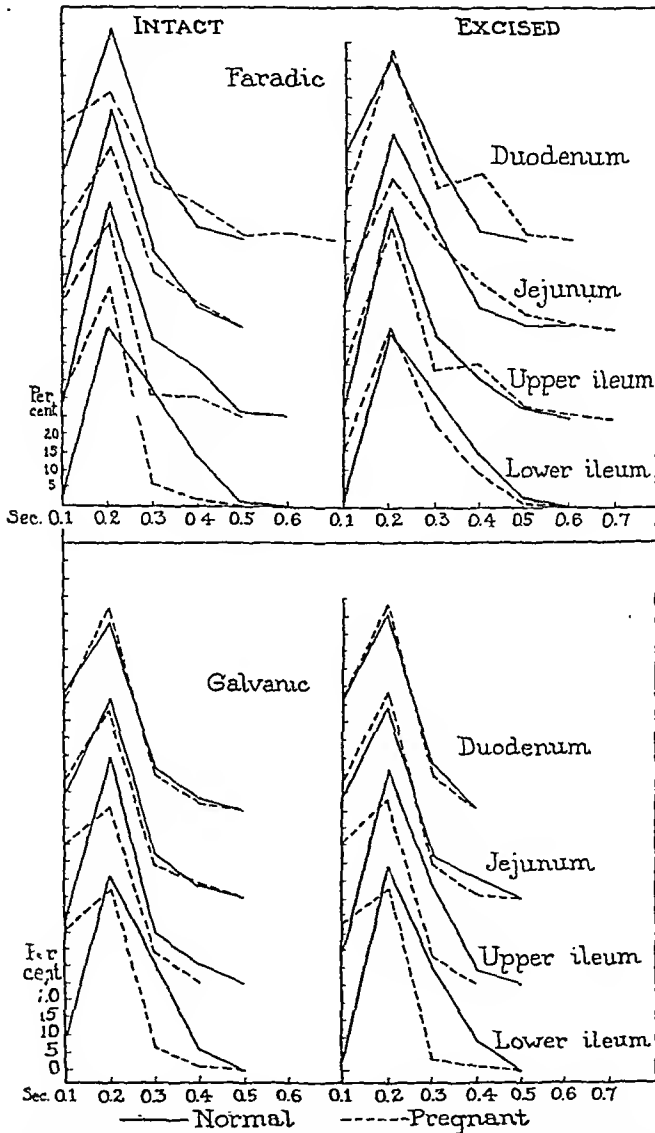


Fig. 1.—Thresholds for faradic stimulation in four different parts of the bowel in normal, pregnant, and puerperal rabbits. Each line represents data from one animal. In the middle group the heavy lines represent flattened gradients; the dotted lines represent reversed or abnormal gradients.

Appearance of the Stomach and Bowel.—On opening the abdomen the appearance of the stomach and bowel was normal, and the rhythmic contractions were active. There was no definite distension or other sign of back pressure in the duodenum or jejunum.

Rate of Rhythmic Contraction.—In both pregnant and puerperal rabbits and in both intact bowel and excised segments the rates of rhythmic contraction averaged

one or two beats a minute slower than in normal animals. The gradient from duodenum to lower ileum was found unchanged, however, except in one animal in which it was reversed.

Irritability.—Thresholds for faradic stimulation were obtained in duodenum, jejunum, upper ileum, and lower ileum. The measurements charted in Fig. 1 represent distances in centimeters on the scale of the inductorium. A Harvard coil was used with one dry cell. It will be seen immediately that the rabbits can be divided into two groups: one with a flattened gradient from duodenum to ileum and the other with a more or less reversed gradient.

The irritability of the duodenum was normal but that of the lower ileum was almost always increased. In the puerperal animals the whole bowel tended to be more irritable than normal, but the gradient remained practically unchanged. It was found flat in only one instance but this was to be expected because this

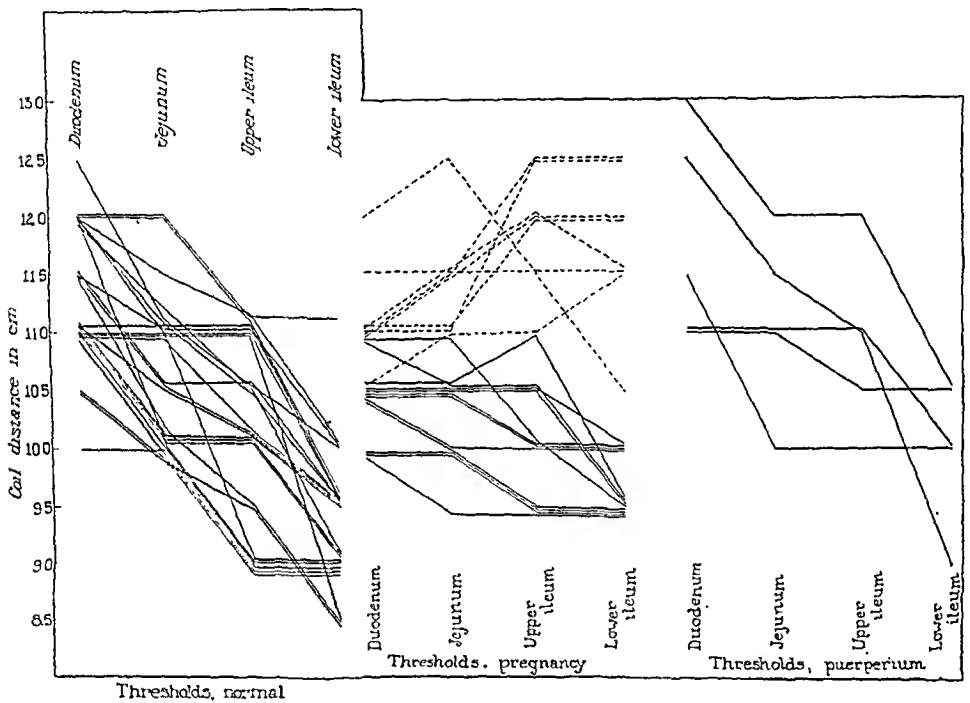


Fig. 2.—Percentage distribution polygons showing latent periods in four different parts of the intact and excised bowel with faradic and galvanic stimuli, in normal and pregnant animals.

particular animal had littered only two hours before it was anesthetized and put into the tank.

We looked carefully for other peculiarities that might differentiate the two groups of pregnant animals with the flattened and the reversed gradients, but with the exception of some differences in conduction to be described later we failed to find any. We could not see any correlation between the amount of change in the gradient and the duration of pregnancy, and when we came to study the latent period of the bowel there was nothing distinctive about the behavior of the animals in the two groups.

Latent Period.—In Fig. 2 it will be seen that both with faradic and galvanic stimuli there was a marked change from normal in the latent period of the intestinal muscle in pregnant animals. With faradic stimuli, in both the intact bowel and excised segments, there was a lengthening of the latent period in the duodenum and a marked shortening in the lower ileum. With galvanic stimuli there was

practically no difference from normal in the duodenum and jejunum but there was a shortening in the ileum. As a result there was, with both faradic and galvanic stimulation, a decided reversal of the usual gradient in latent period from duodenum to lower ileum (Fig. 3).

In the intact bowel of puerperal animals the gradient was markedly reversed with faradic stimulation and flattened with galvanic stimulation. With the excised bowel, both faradic and galvanic stimulation gave results which were erratic and which were not well graded in either direction.

Conduction.—While working with normal animals we found that in the intact bowel 100 faradic stimuli gave rise twenty-seven times to wavelets which could be recorded and measured 5 cm. distant (orad or caudad) from the point stimulated. With the excised bowel there were 47 such wavelets. In pregnant animals these figures were 23 and 19 respectively, showing that there was perhaps a slight impairment of conduction in the intact bowel and a definite impairment in the excised segments.

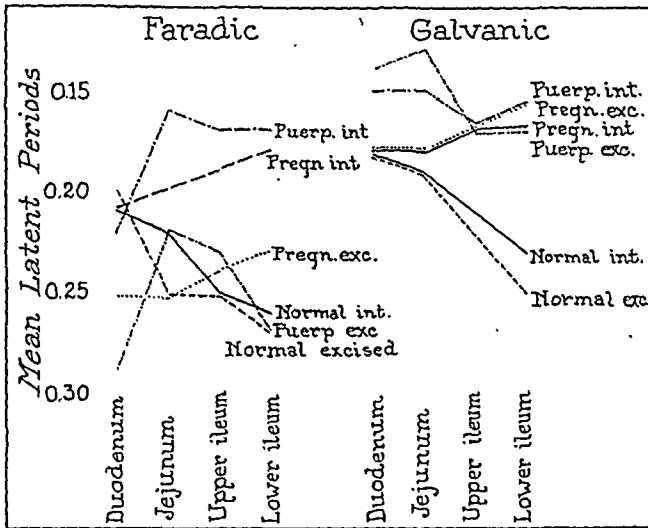


Fig. 3.—Mean latent periods in four different parts of the intact and excised bowels of normal, pregnant, and puerperal rabbits. Latent periods are expressed in fractions of seconds. The lines represent the gradation from duodenum to lower ileum with both faradic and galvanic stimuli.

In the normal bowel, both excised and intact, conduction caudad from the point stimulated is seen oftener than conduction orad. This was true for some regions of the bowel in the pregnant animals, but as can be seen from Table I, it was not true for others. In the normal bowel the rate of conduction caudad was generally a little faster than the rate orad and these rates were graded from about 5.0 cm. a second in the duodenum to 3.8 cm. a second in the lower ileum. This gradation was not so well marked in the pregnant animals, and in them the rates orad tended to be faster than normal while those caudad were definitely slower than normal. This is what one would expect in the presence of flattened or reversed gradients of irritability and latent period. Actually, also, as one would expect, the fastest rates orad and the slowest rates caudad were observed in the animals with the most abnormal gradients of irritability. Unfortunately, these observations, while suggestive cannot be stressed because the probable errors of the figures are large.

The measurements of conduction in puerperal rabbits were so few in number that little can be said about them. In the intact bowel, waves traveling 5 cm. or farther

TABLE I. MEAN RATES OF CONDUCTION IN CENTIMETERS, A SECOND ORAD AND CAUDAD IN DIFFERENT PARTS OF THE BOWEL AFTER FARADIC STIMULATION WITH THE SECONDARY COIL AT 4 CM.

	INTACT BOWEL										EXCISED SEGMENTS										
	NUMBER OF CASES	DUO-DENUM		JE-JUNUM	UPPER ILEUM		LOWER ILEUM		TOTALS		DUO-DENUM	JE-JUNUM	UPPER ILEUM		LOWER ILEUM		TOTALS				
		ORAD	DAD		ORAD	DAD	ORAD	DAD	ORAD	DAD			ORAD	DAD	ORAD	DAD	ORAD	DAD	ORAD	DAD	
Normal rabbits	30 intact 24 excised	5.0	5.6	4.0	4.0	3.8	4.5	3.8	3.8	4.2	4.5	7.1	7.2	6.7	6.8	6.4	6.5	5.6	6.0	6.5	6.7
Pregnant rabbits	18 intact 13 excised	5.9	3.2	4.9	3.1	2.5	2.7	3.1	2.8	4.9	2.9	7.8	4.5	5.6	5.8	5.7	5.5	6.4	5.3	6.1	5.3
Pregnant with reversed gradient of irritability	6 intact 5 excised	7.5	2.5	4.0	3.0	*	2.9	3.5	3.8	5.4	3.1	7.2	4.5	6.0	3.2	6.4	5.3	6.8	4.5	6.6	4.6
Pregnant with flat gradient of irritability	12 intact 8 excised	5.1	3.6	5.1	3.1	2.5	2.6	2.5	2.3	4.7	2.9	10.0	4.5	3.2	8.5	5.5	5.6	6.3	5.4	5.8	5.5

*No data secured.

were seen 31 times for every 100 stimuli applied. This shows a conductivity slightly better than normal. Conduction caudad was easier to demonstrate than conduction orad, but just as in the pregnant animals, wavelets traveling orad seemed to go faster than those traveling caudad.

Peristaltic Rush.—With flattened or reversed gradients of irritability and latent period, one would expect to find some slowing of peristaltic rushes, and actually, this was the striking feature observed as we studied the animals. Rushes not only appeared infrequently but it was hard to start them artificially. It will be noted also in Fig. 4 that the rushes which did appear not only did not travel faster in the lower half of the bowel, as they normally should have done, but they actually slowed down. This phenomenon was observed also in rabbits in which the gradients were artificially reversed by the injection of turpentine into the muscle about the ileocecal sphincter (Alvarez and Hosoi).

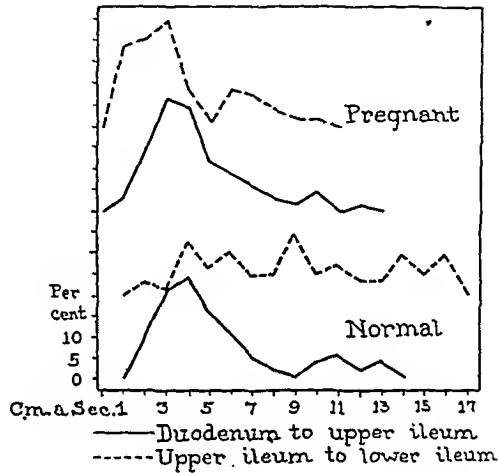


Fig. 4.—Percentage distribution polygons showing rate of travel of a series of peristaltic rushes in the upper and lower halves of the bowel of normal and pregnant animals. The abscissae represent centimeters a second.

DISCUSSION

Although it is far from proved that the gradients in rhythmicity, irritability, latent period, tone conductivity, muscular strength, and metabolic rate demonstrable in the normal bowel are responsible for the caudad direction taken by diastaltic waves, this explanation is probably the most satisfactory one that we have today. In view of the fact that some of these gradients are now found reversed in pregnant animals, and that with this reversal there is better conduction of stimuli orad, definite inhibition of peristaltic rushes, and slowing of the rate of travel of these waves, it appears highly probable that similar changes in the bowels of pregnant women will account for at least some of the nausea and vomiting with which these women are often troubled. If so, we have at last a good and simple explanation for phenomena that have long been puzzling. That there is some slowing of peristalsis in the small bowels of pregnant women is suggested by the fact that in them there is an increase in the amount of indican in the blood (Eufinger and Bader, Seitz).

It seems to us particularly remarkable that such marked deviations from normal should have been demonstrable in the bowel of an herbivorous animal; one in which the maintenance of good gradients would seem to be necessary at all times in order to control the transport of coarse indigestible food through long stretches of thin-walled bowel. From work already done on cats and dogs we suspect that the gradients in their short and thick-walled bowels are much more easily flattened and reversed, and that this may be one reason why they vomit with ease. As is well known, most of the herbivora cannot vomit. The few physiologic observations made so far on the bowel of man suggest that its gradients are of the carnivorous type, poorly marked and poorly maintained, and this would help to explain the frequency with which signs of reverse peristalsis are seen in tired and neurotic and sickly women (Alvarez, 1929, Aseanio and Alvarez, 1929).

Some physiologists may of course be inclined, as for some time we were, to question the ability of anyone to measure accurately the irritability of smooth muscle, especially when it is contracting rhythmically. We can only say that after going over the records again and again we decided that although there was at times doubt about the exactness of single measurements, there never was much question about the existence of a gradient from duodenum to ileum or about its reversal or flattening in the pregnant animals.

We never had any doubt about the reversal of the gradient of latent period because the means were not calculated and the results of the work were not known until twenty animals had been studied. By working in this way we made certain that no mental bias could enter into the reading of the records. There must often be doubt about single measurements of the latent period but when a large number of them are averaged, positive and negative errors tend to neutralize each other, and trustworthy figures are obtained.

The next question that must arise is: How can one gradient be normal, another flattened, and another reversed in the same bowel; and why, if gradients are so essential to the maintenance of normal diastalsis, does food continue to go caudad when some of them are reversed? The future of the gradient theory may depend on securing answers to these questions.

Several years ago, one of us (Alvarez, 1919, 1928), (Alvarez and Starkweather) suggested that the different gradients were probably all closely related and perhaps dependent on some basic gradient of metabolism but he soon came to see that the problem is not so simple. If the gradients were all dependent on one basic gradation in chemical structure or activity, they could hardly vary so independently as we now know they do. Difficulties in the way of accepting a theory are always annoying at first but, as Darwin used to say, when one faces

them and grapples with them they usually turn out to be most helpful and informative. In this case it appears now that the maintenance of one gradient while another is reversed may represent a valuable factor of safety for the organism. It may explain the fact that women who regurgitate and vomit a large part of every meal and who show many signs of reverse peristalsis and back pressure in the digestive tract will generally maintain enough of a downward current through the bowel so that they will not starve to death. Nolf, also, may be correct, and even in the absence of gradients the aborad direction of diastalsis may perhaps be maintained or favored by the presence of valve-like synapses between neurones running longitudinally in Auerbach's plexus.

If a stone is thrown into a river the bed of which has a steep gradient, ripples will not run upstream very far but if the stone is thrown into a river which is meandering slowly through a meadow the ripples will run almost as far upstream as down. Similarly perhaps in a strong healthy woman with a set of steep intestinal gradients, ripples sent off orad from the neighborhood of a diseased appendix or a gravid uterus will not get far and will therefore not produce distress, whereas in a frail little woman with, to begin with poor gradients, the ripples will run all the way back to the stomach and will show themselves as nausea, heartburn, and vomiting.

We cannot yet explain the differences between the observations made on pregnant and on puerperal animals. As has been pointed out, within a few hours after the emptying of the uterus the gradient of irritability regains its normal slope while the gradient of latent period remains upset. One of us (Alvarez) years ago found the gradient of latent period markedly upset also in four puerperal cats. Possibly some substance derived from the fetus or placenta acts particularly on the gradient of irritability or possibly the catabolic changes that accomplish involution of the uterus influence the bowel differently from the anabolic changes that take place during pregnancy.

Remembering that women generally have most trouble with nausea and vomiting during the first few months after conception, we looked for differences in the degree of reversal of gradients in rabbits in the several stages of pregnancy but failed to find any. It may be that the vomiting center of a healthy woman learns to ignore messages sent to it much as it does in sailors on torpedo boats. The sailor who at the beginning of a cruise is paralyzed by seasickness eventually learns to work and to eat in spite of his nausea. This is probably not the only explanation for the cessation of nausea in the later months of pregnancy but it may be one of them.

There is a possibility which might be mentioned here and that is that the idiopathic dilatation of the ureters which is so commonly seen in pregnant women might be due to a reversal of gradients in the ureter

similar to that which we have now found in the bowel. As Hofbauer and others have shown, the ureteral dilatation cannot be ascribed to pressure from the large uterus because it has been observed in the first weeks of pregnancy. Moreover the ureters become sluggish and the interval between contractions is lengthened. There are many curious features about all of the "idiopathic" dilatations of ureters and kidney pelves which may some day be explained when the urologists learn to think in terms of ureteral gradients and the ways in which they might be upset.

If the intestinal gradients are upset in women as they are in rabbits, one would expect food residues to be held back in the duodenum and with this there might go some abnormality in the filling and emptying of the biliary channels. Actually, Higgins and Higgins and Mann have found the emptying of the gall bladder much delayed in pregnant striped gophers, guinea pigs, and dogs. Whitaker and Emerson, who studied a few pregnant cats, found nothing abnormal. In the case of women, it is now well known that especially in the later stages of pregnancy, the concentrating power of the gall bladder is often insufficient to produce a shadow with the dye (Crossen and Moore, Fogelson, Levyn, Beek and Aaron, Benda, d'Amato and Gmelin). All the observers agree that when a shadow can be demonstrated there is no delay in its disappearance after the taking of egg yolk and cream. Gall bladders that have not filled during pregnancy have done so normally soon after confinement. It may be that eventually these studies will throw some light on the relation between pregnancy and cholecystitis.

Now that it has been shown that the gradients along the bowel can be flattened or reversed by pregnancy the next problem is to find some drug which will restore the original steepness caudad. That the quest will not be easy is indicated by a number of considerations. To begin with, is it not curious that after thousands of years of therapeutic experiment with every available substance from animal excrement to gold and precious jewels, man has secured scores of drugs that will produce reverse peristalsis and nausea and vomiting but no single one that will with certainty restore the downward gradients and thereby stop nausea and vomiting?

This fact may perhaps be explained in the following way: In order to restore the normal direction of a reversed intestinal gradient one should either increase the irritability and activity at the upper end of the bowel or else decrease the activity and irritability of the lower end. There are a number of experimental observations which suggest that the irritability and activity of the muscle at the upper end of the bowel are about maximal; as a result any increase will be difficult to secure, and if long maintained, will perhaps do harm. One must look,

therefore, for a depressant drug which will have a greater effect on a region of low irritability than on one of high irritability. At first sight this appears to be a hopeless quest but studies already made (Alvarez, 1919) have shown that a few substances such as adrenalin and magnesium sulphate will, in appropriate dosage, paralyze the excised ileum and leave the excised duodenum and jejunum active. These studies must be repeated with the intact bowel, and with many drugs.

SUMMARY

In pregnant rabbits experiments show that the rate of rhythmic contraction in the small bowel was slightly slowed but there was no change in the gradient from duodenum to ileum. The gradient in irritability was flattened in some of the animals and reversed in others. The gradient of latent period was always reversed. Conduction was somewhat changed in that waves moving orad traveled a little faster than those moving caudad.

Peristaltic rushes were inhibited. They were hard to start and they slowed down instead of accelerating as they normally should do.

In puerperal animals the bowel was unusually irritable but the gradient of irritability was normal. The gradient in latent period was reversed.

In sickly animals some gradients are reversed or flattened while others remain normal. This may be a factor of safety enabling the organism to continue with digestion at such times when there is a marked tendency to reverse peristalsis in the bowel.

It is to be hoped that a drug can be found which will restore gradients to normal. The difficulties in the way of finding such a drug are discussed.

It is suggested that the reversal of gradients may be present in pregnant women and that it may account for some of their nausea and vomiting.

It is suggested also that the dilatation of the ureters so commonly seen in pregnant women may be due to a reversal in the ureteral gradient from kidney pelvis to bladder.

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FIBROSARCOMA ARISING IN OVARIAN FIBROMA

BY HAROLD D. CAYLOR, M.D.,* AND JAMES C. MASSON, M.D. (TOR.),†
ROCHESTER, MINN.

IN 1925, one of us (Caylor) reported two cases of sarcoma associated with ovarian fibroma. Meigs, in 1922, studied a case of fibrosarcoma which apparently had arisen in an ovarian fibroma. The patient was 53 years old, had borne one child, and had passed the menopause. She complained of enlargement of the abdomen. Operation revealed a fibrosarcoma of the ovary associated with ascites. Rohdenburg, in a recent study of 500 tumors of the ovary, mentioned that one of the tumors was apparently a sarcoma that had arisen in an ovarian fibroma. Sarcoma of the ovary is not common; only 2 sarcomas were found in a series of 39 solid malignant tumors of the ovary in which abdominal section was performed at The Mayo Clinic.

We shall report here 2 cases (Cases 3 and 4) of fibrosarcoma that originated in ovarian fibroma and shall compare these data with those of the 2 cases (Cases 1 and 2) which were previously reported.

CASE 1.—The patient was a woman 55 years old, who came to the clinic because of a recurring vaginal discharge, frequency and urgency of urination, indigestion, and headaches. She was the mother of three children. She had passed the menopause at the age of 45 years, and since that time her health had been poor. A sister had died of carcinoma. The cervix had been amputated with relief from the vaginal discharge for one and a half years. Six months before she came to the clinic the discharge recurred.

There was bleeding from the vagina during the examination. Through the rectum a hard nodular tumor could be felt in the position of the uterus pushing it to the left. There was slight secondary anemia. The uterus, both fallopian tubes, and the ovaries were removed. The convalescence was uneventful.

The uterus measured 6 × 4 × 3 cm. Just beneath the endometrium was a fibromyoma 1 cm. in diameter. The left ovary was atrophic, gray and firm, 3 × 2 × 2 cm. Both fallopian tubes were patent. The right ovary was 8 × 7 × 6 cm., white, hard and slightly nodular, and weighed 130 gm. At one pole was a raised light brown ridge, 6 × 3 × 2 cm. Cut surfaces of the right ovary before it was fixed in formalin were light gray, and stippled with soft finely granular and tan areas. The largest of these was 9 × 4 mm. The brown ridge already

*From the Section on Surgical Pathology, The Mayo Clinic, Rochester, Minn.

†From the Division of Surgery, The Mayo Clinic, Rochester, Minn.

mentioned was soft, friable and closely resembled the tan areas. Microscopic examination disclosed apparently thin endometrium and glands widely separated by infiltrated tissue. The uterine arteries were sclerotic. The left ovary was typically fibrous. There was a fibroma of the right ovary infiltrating and invading this fibrosarcoma, graded 2. A capsule was not demonstrable between the benign and malignant tumors. Mitotic figures were common in the sarcoma cells. The patient was alive and in her usual health five years after operation.

CASE 2.—The patient in this case was a woman, 62 years old, the mother of seven children. She came to the clinic because of rapid enlargement of the abdomen beginning four months previously. There was a dull dragging pain in the right iliac region, especially noticeable after she had been on her feet all day. She had "gas on the stomach," was constipated, and had lost slightly in weight during the last year. She had passed the menopause at the age of 50 years. In 1914, the appendix and gall bladder had been removed at The Mayo

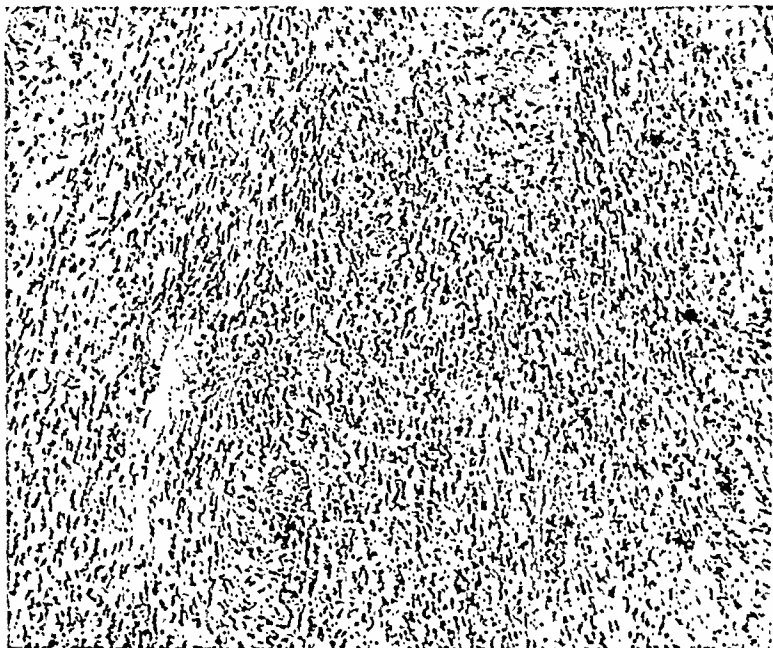


Fig. 1.—(Case 3) Fibroma containing many erythrocytes (x100).

Clinic. At that time an old pelvic inflammation was noted on the left side which was not disturbed. Laparotomy was again performed in the clinic in 1919. The abdominal cavity contained about 8 liters of clear fluid. There was a large spontaneously ruptured cyst of the left ovary containing in its cavity a solid tumor. The right tube and ovary were grossly normal and were not removed. The ascites was apparently from the ruptured cyst.

Examination of the left tube and ovary revealed a thick-walled tube, the mucosa apparently being the seat of an old inflammatory lesion. The ovary was a large sac, 16 × 15 × 10 cm., weighing 150 gm. Inside the thin-walled cyst was a hard nodular gray tumor 8 × 5 × 3 cm. After five years in 10 per cent formalin, cut surfaces of this hard mass were white to light cream, dotted with blue and black hemorrhages. Interlacing whorls and bands of fibers were prominent. In some places the tumor was soft, in others, firm.

Microscopically the tumor was made up chiefly of fibrous connective tissue cells. In areas the cells were widely separated, apparently by fluid. In other sections,

taken from the soft areas, the connective tissue stroma was invaded by many cells with highly staining nuclei. These cells were closely packed together. In the sarcoma cells there were occasional mitotic figures. This was apparently a fibrosarcoma, graded 2, arising in fibroma of the ovary and associated with a ruptured ovarian cyst. The patient was alive five years after the operation without signs of recurrence or metastasis.

CASE 3.—A woman, 66 years old, the mother of one child, had passed the menopause at the age of 52 years suddenly. The patient had visited the clinic on many occasions for a variety of complaints. In the course of several examinations a small hard tumor was noticed in the right side of the pelvis which was assumed to be a fibromyoma of the uterus. She had complained, at intervals, of pain and soreness, increased by pressure, in the left iliac region. In December, 1927, she was seized with acute cramping abdominal pains, at first generalized, later

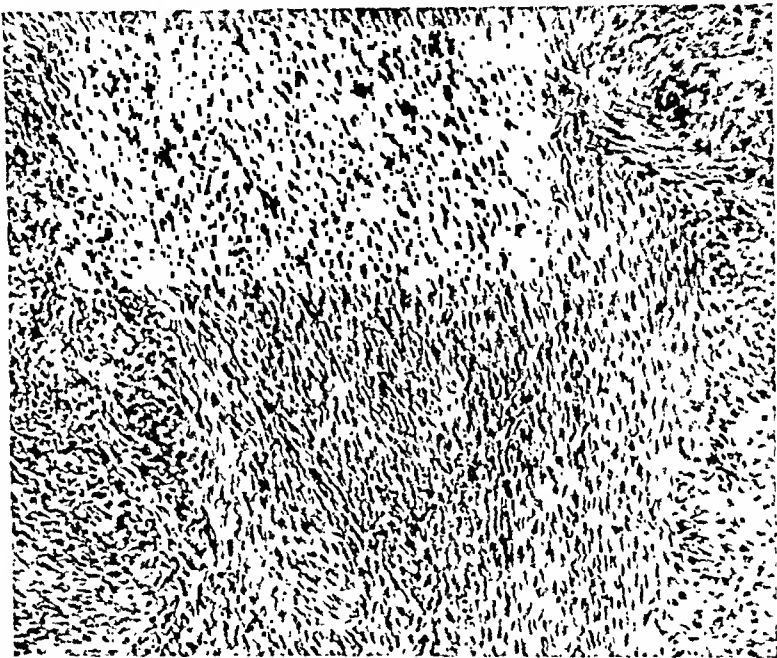


Fig. 2.—(Case 3) On the right margin is the fibroma. The other two-thirds are fibrosarcoma, graded 2. The malignant neoplasm is indicated by closely packed large spindle-shaped cells (x100).

localized in the lower abdominal quadrants. The leucocytes numbered 10,500. Urinalysis was negative. Appendicitis was suspected, and abdominal exploration was advised.

Under ether anesthesia and through a right rectus incision, an emergency abdominal exploratory operation was performed. The liver, gall bladder, stomach and duodenum were apparently normal. There was marked injection of the loops of small intestine which were seen during the course of the operation. The appendix revealed similar injection of its vessels. There was a hard, hemorrhagic tumor in the position of the right ovary, which was attached by a short pedicle and was twisted several times. The tumor was undergoing degenerative changes and revealed many dark hemorrhagic areas. The right ovary, which was apparently involved by the tumor, was removed. The uterus was about twice normal size and apparently contained small fibromyomas. The pathologists believed that the condition had been primarily fibroma of the right ovary and that sarcomatous

changes were probably recent. The wound was closed without drainage, and the patient was dismissed from the hospital after fifteen days in good condition. Subsequently she was given two courses of roentgen-ray treatment, and 2420 milligram-hours of radium were applied through the vagina.

Eighteen months after the operation the patient returned to the clinic, with a tender mass in the left broad ligament and a history of occasional discharge of bloody mucus from the vagina. Whether the mass was a recurrence of the sarcoma or an inflammatory lesion could not be determined. The patient's general health was good; she had not lost weight and was not anemic.

The right ovary weighed 410 gm. and measured $11 \times 9 \times 8$ cm. It was hard and slightly nodular, and practically all of the gross structures were obscured by the extensive hemorrhages throughout the tumor. There were a few small areas of gross edema with beginning necrosis.



Fig. 3.—(Case 4) The fibrosarcoma composed the dark colored area in the upper half of the specimen. The lower portion of the tumor is the fibroma.

Microscopic examination of tissue from the tumor revealed two distinct types of neoplasm. One structure was a hemorrhagic tumor composed of fibrous connective tissue with areas of degeneration and edema, apparently a hemorrhagic edematous degenerating fibroma of the ovary; the other structure was a more cellular tumor composed of large, apparently rapidly growing spindle-shaped cells containing an occasional mitotic figure (Figs. 1 and 2). It was diagnosed fibrosarcoma, graded 2. The sarcoma apparently originated in and invaded the fibroma.

CASE 4.—The patient was sixty-two years old, and was the mother of ten children, seven of whom were living and well. She came to the clinic because of post-menopausal bleeding and a small abdominal tumor which had been present for three months. The patient had been in excellent health except that in 1919 she had had influenza but had recovered uneventfully. She had been married for forty-two years, and had lived on a farm and worked hard. She had passed the climacteric



Fig. 4.—(Case 4) The right half of the picture is fibroma and the left half is the fibrosarcoma, graded 2 (x100).

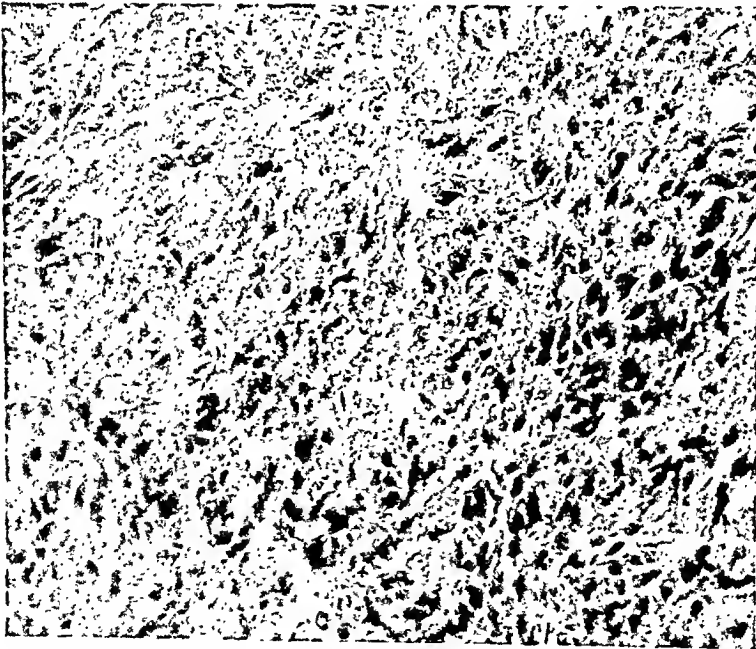


Fig. 5.—(Case 4) Higher magnification of the fibrosarcoma indicating more intimate details of the tumor cells (x200).

at the age of 44 years, and until seven months before coming to the clinic she had not had vaginal discharge; then there was what was thought to be menstrual discharge lasting four days. One month later the bleeding recurred; this ceased until a week before admission to the clinic when there was again "spotting" after a vaginal examination. Three months after the first bleeding was noticed, a small hard abdominal tumor was discovered by the patient. This tumor had apparently gradually increased in size. Visible nodular enlargement of the thyroid gland had been present for four years.

General examination revealed a hard movable abdominal tumor approximately 10 × 10 cm., attached to the left of the fundus of the uterus. There was a small adenoma of the left lobe of the thyroid gland. The hemoglobin was 72 per cent; leucocytes numbered 6400 and the erythrocytes 4,710,000. Urinalysis was negative. The clinical diagnosis was pelvic tumor associated with uterine bleeding, and operation was advised. Surgical treatment for the adenoma of the thyroid gland was deferred.

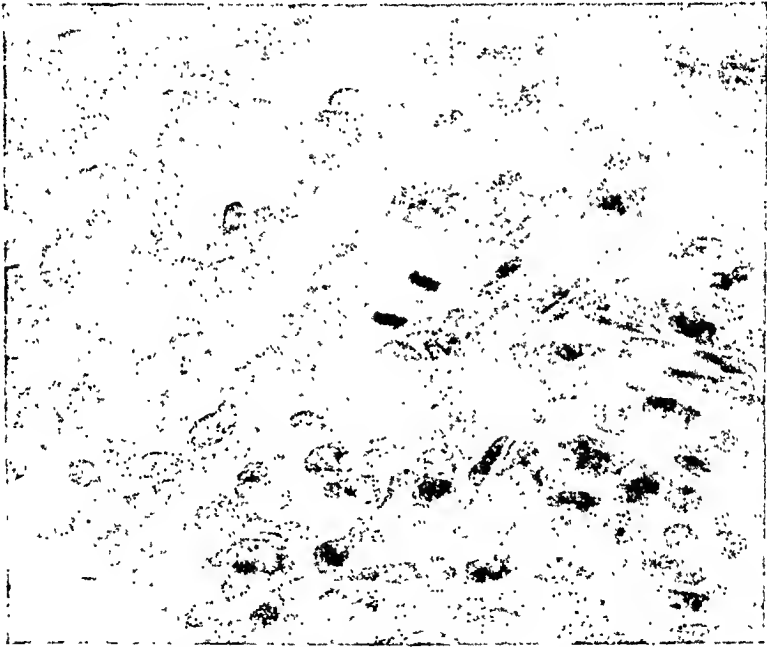


Fig. 6.—(Case 4) Mitotic figure in a sarcoma cell (x500).

Under ether anesthesia, through a median line incision, a tumor was removed which involved the left ovary and measured 13 × 7 × 6 cm., in its greatest dimensions, and weighed 450 gm. It was covered by smooth peritoneum. The fallopian tube on this side was likewise removed. There were multiple simple cysts of the left ovary, the largest 3 cm. in diameter, and this organ was removed. The appendix was removed and revealed considerable fibrosis of the wall which was considered evidence of trouble in the past. The wound was closed in the usual manner without drainage. The first day after the operation the output of urine was only 600 c.c. This rapidly decreased in amount until complete anuria developed, and the patient died three days after operation. Necropsy did not reveal evidence of metastasis of the sarcoma.

Just beneath the surface of about half of the tumor of the left ovary, were many large veins, in contrast to the remainder of the neoplasm which was comparatively avascular. Cut surfaces revealed three distinct areas in the tumor

(Fig. 3). About half of the newgrowth was composed of fibrous tissue which varied from gray to white, in interlacing whorls. There was sharp differentiation of this area and the area which varied from light tan to brown and composed the remainder of the tumor. This was near the vascular portion of the tumor already described. In almost the center of the brown area the tissue was apparently more vascular, slightly edematous and mottled with small hemorrhages and areas of degeneration (Fig. 3).

Histologic studies of the white fibrous areas and of the tan areas revealed marked differences. The former were composed of dense fibrous connective tissue typical of an ovarian fibroma, in contrast to the latter which were composed of many large spindle cells closely packed together and apparently invading the fibroma (Figs. 4 and 5). There were mitotic figures in some of these spindle cells and a diagnosis was made of fibrosarcoma, graded 2, apparently originating in an ovarian fibroma. In the center of the sarcomatous part of the tumor were areas of hemorrhage and myxomatous change. There was not gross or microscopic evidence of invasion of the sarcoma into the fallopian tube which was removed at the same time.

COMMENT

Rohdenburg in his study of 500 tumors of the ovary found 23 fibromas (4.6 per cent). In this same group of cases there were 15 sarcomas (3 per cent). Sheffey, in 118 cases of sarcoma of the ovary, found that 60 per cent occurred before the age of 14 years, and that ovarian sarcoma formed about 4 per cent of all tumors of the ovary and from 5 to about 14 per cent of the malignant tumors of the ovary, according to various observers. In The Mayo Clinic 280 fibromas of the ovary have been removed, and of this number, 4 have apparently been the site of the origin of sarcomatous change, so the percentage of sarcomatous change in the ovarian fibromas in this series was approximately 1.5.

The cases in the previous report and in this report have some features in common (Table I). The ages ranged from 55 to 66 years; three patients were in the seventh decade. All the patients had borne children, and all had long since passed the menopause. There was a variety of symptoms which included indigestion, urinary disturbance, enlargement of the abdomen, tumor and postmenopause bleeding.

The lesions in three cases included a hard pelvic tumor. In one case, because of hydroperitoneum from a ruptured ovarian cyst, the tumor was not palpable. Ovarian fibroma and sarcoma are sometimes associated with ascites, as Meigs reported. Other signs of malignant neoplastic disease, such as secondary anemia, loss of weight and cachexia, were found only once in this group of patients. Perhaps this was due to the apparent absence of metastasis.

In two cases there was a history of postmenopause bleeding. Babes recently noted that hyperplasia of the endometrium is common in cases of ovarian tumors, and that menorrhagia, metrorrhagia and postmenstrual bleeding are likely to be accompanying symptoms of these neoplastic diseases of the ovary. In three of the four cases there was no

TABLE I. SUMMARY OF FOUR CASES

CASE	AGE, YEARS	HISTORY	SYMPTOMS	DATA ON EXAMINATION	DIAGNOSIS
1	55	Married, three children; menopause at 45 years; one sister died of carcinoma	Urinary disturbances; "indigestion"; headache; postmenopausal bleeding	Hard nodular tumor felt through the rectum; slight secondary anemia	Fibroma of the right ovary with a fibrosarcoma, graded 2, apparently invading it
2	62	Married, seven children; menopause at 50 years	Enlargement of abdomen; dragging pain in right iliac region; "gas on stomach"; constipation; loss of 4 pounds in one year	Enlargement of abdomen apparently from fluid	Hydroperitoneum from spontaneously ruptured left ovarian cyst containing in its cavity a fibroma and a fibrosarcoma, graded 2
3	66	Married, one child; menopause at 52 years	Acute abdominal symptoms due to twisting of the pedicle of the fibroma and fibrosarcoma	Hard nodular tumor felt on vaginal examination for about five years before operation; acute cramping abdominal pain at time of operation	Fibrosarcoma, graded 2, in a fibroma of the right ovary
4	62	Married, ten children; menopause at 44 years	Postmenopausal bleeding on two occasions; small abdominal tumor discovered by patient	Hard pelvic tumor	Fibrosarcoma, graded 2, in a fibroma of the left ovary

evidence of recurrence or metastasis of the original disease, and in one patient (Case 3) in which there was a possibility of recurrence or metastasis, the evidence was indirect and inconclusive.

Grossly, in two of the ovarian tumors the sarcoma and the fibroma could be easily distinguished; the former was composed of tissue which varied from light brown to tan and was slightly granular, in contrast to the white fibrous structure so characteristic of fibroma. Microscopically the lesions were quite different. The fibromas were composed of fibrous connective tissue in contrast to the fibrosarcomas which were made up of closely packed spindle cells containing large nuclei and irregular mitotic figures. The four fibrosarcomas were graded 2.

From the pathologic and surgical viewpoints these sarcomas, that apparently arise in ovarian fibromas, seem to be different from more common sarcomas usually seen in children or young adults which metastasize early and are almost always fatal.

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Pastiels: Dystocia Due to an Ovarian Cyst. Suprapubic Cesarean Section Followed by Oophorectomy. Bruxelles-med. 8: 175, 1927.

Pastiels reports in full a case of mucoid cyst of the left ovary discovered during the sixth month of pregnancy. The patient was kept under close observation. After two hours of labor the head had not engaged and the cyst was presenting in the pelvis. A low cesarean section followed by left oophorectomy were therefore done. The child was normal and the mother made an uneventful recovery.

In 278 cases reported in literature where the cyst was within the pelvis, Puech and Vauvert ascertained dystocia in 262. These authors also feel that the earlier in pregnancy the cyst is removed the less is the chance of spontaneous abortion. Pastiels, therefore, advocates operative removal before the third month. After this time he intervenes only in case of emergency, letting the patient go to term and doing a cesarean section and oophorectomy at that time if circumstances warrant this procedure.

THEODORE W. ADAMS.

THE TETANOID SYNDROME IN OBSTETRICS

(A PRELIMINARY REPORT)

BY E. C. HARTLEY, M.D., ST. PAUL, MINN.

THERE is a group of symptoms rather commonly observed in pregnant women so closely related to clinical manifestations of the tetanoid state that they may be regarded, at least for the purposes of study, as being due to a condition of hypocalcemia which in turn is consequent upon an acute hypoparathyroidism, or a hypoparathyroidism which is only relative and has become apparent at this occasion of especial demands upon it.

These symptoms are cramp-like or aching pains in the legs and thighs, an irritability of disposition unusual to the patient, insomnia, and often an edema of the extremities apparently not associated with cardiac or nephritic pathology. So frequently may these symptoms be found in association in pregnant women that one inquiring about them expects to find them concurring and comes to look upon them as a syndrome. To these symptoms must also be added paresthesias of the extremities, usually of the hands and feet, or of the great toe only, or a few fingers, but occasionally involving considerable areas.

With this syndrome there may be other symptoms no less a part of a tetanoid state, but which occur with less regularity and possibly represent a more aggravated and involved disturbance of calcium metabolism or of parathyroid function. Several of these were found in patients whose histories are given below; they will be discussed along with those symptoms which constitute the syndrome.

Tetany, of which the condition under consideration is a variation in degree rather than in kind, has been defined by Falta and Meyers¹ as follows: "By tetany we mean an abnormally increased condition of excitement of the nervous system, which is demonstrable in a heightened excitability of the motor, sensible, sensory, and vegetative nerves, and under certain circumstances in paresthesias and bilateral intermittent, for the most part painful, spasms, with intact consciousness, or which becomes manifest through phenomena of irritation on the part of the vegetative nerves. To the picture of tetany belong also trophic and certain metabolic disorders. The manifestations are the result of an insufficiency of the parathyroid glands."

The classification of the syndrome under discussion as one directly related to tetany is based upon its uniform and fundamental resemblance to the phenomena characteristic of true tetany, and upon the reaction of individuals having such symptoms to the therapeutic agents used for the treatment of true tetany: neither Chvostek's sign nor

Trousseau's phenomena have been elicited from any of the patients herein reported. But since the condition here discussed resembles tetany only in degree, it is not surprising that clinical diagnostic signs characteristic of a maximum nervous excitability should be absent in this milder manifestation of a similar condition.

For a considerable time it has been observed that tetany develops more readily in either humans or animals during pregnancy and lactation, or even during menstruation, than at other times. Trousseau, in 1854, proposed that it be called "rheumatic contracture of nursing women." In his report on *Endemic Tetany in the Gilgit Valley*, McCarrison² particularly emphasizes the predilection of the disease for pregnant or nursing women, or for those who had borne children. He qualifies this statement by the observation that in that region nulliparous females more than fifteen years old are rare. Williams³ says that tetany during pregnancy is a rare disease; he calls attention to the fact that with some patients the disease appears only during pregnancy, being absent at other times. DeLee⁴ says that milder forms of tetany are not rare, "indeed, tetanoid symptoms are quite common in pregnancy, but the severe cases are rare and they may be fatal. The second half of pregnancy is the usual time, but it may appear during lactation. Recurrence is frequent. . . . Parathyroid insufficiency is the cause of tetany and pregnancy develops it. The lack of calcium due to the large amount consumed by the fetus may be contributory." Dragstedt⁵ observes that "pregnancy not only increases the severity of tetany and shortens the life of recently parathyroidectomized dogs, but it regularly transforms a latent into an active and often fatal tetany. Dogs and rats, in which a chronic parathyroid deficiency has been produced by partial extirpation, although free from tetany for months, develop manifest tetany at each pregnancy." He adds that the fetal parathyroids cannot function vicariously for the mother (dogs and rats) as is the case with the internal secreting function of the fetal pancreas. Barker⁶ says, "Maternity seems to throw an especial burden upon the parathyroid glands, and parathyroid insufficiency easily develops during the process. Even menstruation may be the cause of the development of tetany, or an existing tetany, may in its course, be aggravated by the occurrence of menstruation."

Since I have nowhere come upon these symptoms considered as a group having a common etiology, I shall discuss each separately in its rôle as a probable expression of the basic pathogenetic factor of hypoparathyroidism.

The aching or cramp-like pains of the extremities have their counterpart in the muscle, bone and joint pains of true tetany. One of the earliest observers of tetany, Steinheim, regarded the disease as a peculiar form of rheumatism. Obstetricians refer to the neuralgia and neuritis of pregnancy. DeLee, in the fifth edition of his textbook, says: "Pain in the nerves, especially the trigeminal, the ulnar, and the sciatic, is frequently noted in pregnancy, and is generally treated as a neuralgia, but often prickling sensations, numbness, and a slight paralysis of the member or members show that the nerve is deeply involved—that a neuritis exists. Polyneuritis, with a marked paralysis, even atrophy, has been observed, and has been ascribed to toxemia."

The insomnia cannot be so directly related to an identical symptom of true tetany. Its cause is probably related to the rather common disturbances of the sensorium seen in tetany. Falta and also Barker quote the observations of Frankl-Hochwart on certain cases in which hallucinatory confusion accompanied tetany. They refer also to Krapelin's description of cases in which psychoses occurred in combination with typical signs of tetany. In Lisser's⁷ tetany patient, a post-partum psychosis developed about twelve hours following cesarean section and lasted for two days, clearing up gradually from an onset which was "quite severe." Shannon⁸ finds psychic disturbances a common symptom in infantile tetany. Peculiar conditions of excitement have been observed by Erdheim in parathyroidectomized rats. An emotional instability is common in the histories reported below; there is a tendency to cry easily and to become irritated over trivial events in everyday life. A. M. Barrett of the State Psychopathic Hospital at Ann Arbor (from Barker) says, "There is no specific tetany psychosis, but the neuromuscular disturbances and the psychosis are both the result of a toxic process affecting the central nervous system."

The edema recorded as part of the syndrome is probably due to angiospasm. Falta and Rudinger call attention to vasomotor disturbances in all cases of acute tetany. Of these, a tendency to dermographism, a "pudgy" look about the face, complaints of congestion in the head, and a moderate pallor were noted among the patients whose histories are given. Several of Shannon's patients had marked edema.⁸

Paresthesias are very common in tetany; they constitute a part of the classical syndrome of that disease. Grant and Goldman,⁶ in the tetany of forced respiration, describe the constant occurrence of paresthesias before the onset of the tetany spasms. F. Parks Weber⁶ has suggested that the numbness and tingling in the hands and feet and the motor symptoms of tetany may be regarded as analogues of the paresthesias and the vasomotor phenomena known as Raynaud's disease. DeLec, in his discussion of neuritis, says: "Not rarely pregnant women complain of numbness and pricking of the fingers, with lack of power in the hands, and examination shows the members to be puffy, slightly cyanosed, with diminished tactile sensibility, and occasionally tenderness of the ulnar nerve is discovered."

In tetany, cardiac disturbances, such as palpitation, increased rate, alterations in the heart sounds have been observed; even cardiac murmurs have been known to appear following an attack. Palpitation and an increased rate were observed in several of the patients herein described.

The relative inertia of the uterus in labor and its marked atony after delivery were striking features of the clinical picture in several of the histories given below. Falta refers to illustrative cases by Erdheim and by Nuemann. The ineffectiveness of extraordinary amounts of pituitary extract was surprising, particularly in Case 1. Without attempting to draw conclusions, it is nevertheless interesting to note at this point two premises: Dragstedt has observed that a parathyroidectomized dog has a lowered resistance to histamine poisoning; Hofbauer,⁹ in an article inquiring into the possibility of histamine poisoning being an etiologic factor in the toxemias of pregnancy, has observed that histamine may be produced in the maternal body and that its presence hinders the contractility of the pregnant uterus by reason of its antagonistic action to the pituitary secretions.

There are a number of substances to which the parathyroidectomized dog is hypersensitive to such a degree that their introduction may precipitate an attack of tetany: this is noteworthy in connection with the reaction of several of my patients to morphine, which is one of the sub-

stances in question. Ergot, atropine, tuberculin, etc., act in a similar manner.

In several of the cases discussed below, severe menorrhagia and metrorrhagia were present; in one, however, (not included here) whose blood calcium was 8 mg., the menstrual flow was quite moderate. For Case 1, however, the parathormone apparently controlled an excessive metrorrhagia when the ordinary means failed. In general, that aspect of the therapy here used was not conclusive enough to permit any conclusions to be drawn as to its value in the control of excessive menstrual bleeding.

The blood calcium readings in the patients here studied do not consistently correspond to the clinical findings. In the more severe cases it was definitely below normal, but symptoms occurred in some in whom the blood calcium estimation proved normal, and in those in whom it was low, clinical improvement lagged considerably behind the more speedy adjustment of the one chemical element in the problem which lends itself to rapid quantitative determination. It is probable that the serum calcium estimation does little more than form a partial criterion for judging the state of the mineral metabolism alone; other minerals, notably phosphorus, appear to be concerned, and the place of vitamine D in the picture is possibly deserving of more attention than has been given it here. Ergosterol was first isolated from ergot by Tanret, and "is the parent substance of vitamine D, and, though of itself physiologically inert, when exposed to ultraviolet rays acquires antirachitic properties of an enormous magnitude and becomes a factor of extraordinary potency in calcium metabolism."¹¹ The total significance of the parathyroids themselves is not clear, particularly their relation, reciprocal or otherwise, with such other glands of internal secretion as the thyroid and the ovaries.

The treatment of these patients included such measures as will stimulate calcium metabolism and increase the amount of that mineral in the body. These are the oral administration of calcium, the use of parathormone* and of irradiated ergosterol. Several forms of calcium were tried which proved difficult for the patients to take; calcilact,* an effervescent calcium lactate, has proved palatable enough for patients to take without complaint over considerable periods. The dosage of the calcilact has been from 120 to 180 grains daily. Parathormone injections have usually been from 30 to 40 units at three to five or more days intervals. The irradiated ergosterol has been used in quantities of 10 drops daily. No consistent dosage has been followed; a tentative and changeable schedule has been employed, almost perforce.

Allen and Goldthorpe¹⁰ feel that the optimum dosage is "about 40 units intramuscularly, given each day over a period of five days." They obtained, in some

*The parathormone and the calcilact used in this study, and being used in a continuation of this study, are furnished in part by the Eli Lilly and Company, Indianapolis, and the Abbott Laboratories, Chicago, respectively.

of their cases, calcium levels as high as 13.24 to 15.5 mg. per 100 c.c. plasma. At these levels their patients complained of headache, nausea, and a rapid pulse. Smith and Elvove¹¹ have studied the action on the rabbit of irradiated ergosterol in toxic and physiologic doses to ascertain its effects upon the calcium content of certain organs and tissues, as well as upon the calcium and inorganic phosphorus of the serum. They found that doses of irradiated ergosterol greater than 1 mg. are decidedly toxic to the rabbit, "and that the toxicity of this substance appears to be related to the size of the individual dose rather than to the total dose administered over a certain period of time, which suggests that the substance is disposed of at a fairly rapid rate." The dosage used by them was given to animals weighing on the average about 2200 grams. With the higher dosage of the irradiated ergosterol they found a considerable deposition of calcium in the tissues of the kidney, lung, and aorta; this appeared to occur only when there was a concurrent rise of both the serum calcium and the serum phosphate, and that without the latter there was no tissue calcium deposited, however high might be the serum calcium.

CASE REPORTS

CASE 1.—Para vi; age thirty-four years. Neither parent had brothers or sisters. Patient had two sisters and one brother, all are married but childless. In infancy the patient had measles. At the age of eleven years a goiter developed. There were exophthalmus and moderate difficulty in breathing due to pressure. For several years she took iodine. At the age of twelve years she had a series of x-ray treatments of the goiter with relief. At fourteen years she had hemorrhagic smallpox. She was critically ill three years ago with scarlet fever and pneumonia. For five days during this illness she had "bladder" hemorrhages.

She was married at seventeen years; became pregnant three years later. During this first pregnancy she grew in height $4\frac{1}{2}$ inches. She had 3 pregnancies since; 3 children were living, aged thirteen and ten years, and 10 months; one died at five years of encephalitis.

She went beyond term with the first pregnancy; labor lasted five days; instrumental delivery of $12\frac{1}{2}$ lb. child; severe postpartum hemorrhage; transfusion.

There followed a two and one-half year period of amenorrhea, terminating in her second pregnancy. In this period she suffered with dizzy spells, hot flashes, insomnia; she thought it was the menopause. The second labor lasted intermittently for two weeks; four times she entered the hospital, only to return home as pains stopped. On returning home the last time, while seated in a chair, she had an alarming feeling of giddiness, "as though floating." She went at once to the hospital. There were no pains, but she was found to be ready for delivery; she was anesthetized and a low forceps delivery done.

In the third labor the membranes ruptured spontaneously at home. She again had an instrumental delivery at the end of thirty-six hours. During the last month of this pregnancy she was confined to a chair by pains in both thighs; she had insomnia, also.

Her fourth pregnancy, during which I attended her, began September, 1927. Early nausea and vomiting set in. There were cramp-like pains in left thigh, leg, and knee. Nausea and vomiting ceased at four and one-half months, perhaps because of two injections of corpus luteum extract. Beginning in February she had coryza, pharyngitis, and cough which was but little relieved by sedatives. During the next few months she had almost daily abdominal cramps. These increased in frequency in July. Since she was resting poorly at home, and since it was thought best not to permit pregnancy to go past term—as had been the case in preceding pregnancies—she entered the hospital July 14. She had no rest from the cramp-like pains; morphine excited her, and the usual sedatives had but little

effect. An effort to start labor by the use of castor oil, quinine, and pituitrin was made without effect, although 6 c.c. of pituitrin were used. The same painful, ineffectual, mechanically mild uterine contractions continued. A large Voorhees' was inserted through the cervix easily, 2 lb. traction attached, and pituitrin given. She expelled the bag in eight hours. She could not rest, nor were her occasional pains effective. Her pulse rose to 150, and she became increasingly restless. A version was therefore done, since no engagement had taken place. The operation was surprisingly easy; a male infant was delivered, condition excellent, weight 7 lb., 6 oz. Postpartum progress uneventful; home on eleventh day.

At the end of seven weeks metrorrhagia at weekly intervals set in. There was leucorrhea. A dry, scaly rash appeared on either face or hands coincident with the bleeding. The cervix was soft, the uterus partially retroverted and boggy. The vaginal portion of the cervix was widely eroded; it was cauterized with a nasal tip cautery. Bleeding ceased for five days. She was seen two weeks later, looking tired and worn; there had been almost daily bleeding. Topical application of 20 per cent mercurochrome to cervix, and hot Bocarol douches recommended. After three weeks without bleeding, she looked and felt much better. Then (November 15, 1928) she had a hemorrhage, saturating her clothing and several bath towels. Blood calcium was 8.9 mg. Parathormone 1 c.c. was given, and calcilact, one teaspoonful 4 times daily. In five days the blood calcium was 9.45 mg. Bleeding stopped and subjective symptoms improved. On May 1 she began having rhinitis and uterine bleeding at weekly intervals. On June 4, while at a theater with her husband, she was seized with severe, cramp-like pains in feet and legs. She was carried out. Pains kept her awake most of that night. The next day she was given 1½ c.c. parathormone and told to resume calcilact. The following day she was able to be about in comfort. Pain in left knee began improving rapidly. By July 18 she spoke enthusiastically of her sound sleep—"the best in many months." All pains in extremities disappeared. She felt brighter, less irritable.

CASE 2.—Para iii, age thirty-four years. Menstruation began at thirteen years, regular, twenty-eight-day type. Profuse flow, duration nine days, large clots. Severe cramps precede flow by two days and continue throughout. Moderate emotional disturbances during period. About one year before menses changed to three-weeks type, with cramps much less severe.

During her first pregnancy she had difficulty in sleeping. There was moderate edema in extremities. Blood pressure and urine were normal. Labor lasted eighty-six hours. Baby weighed 7 lb. 9 oz.

She was sleepless and nervous throughout the second pregnancy. Edema of hands, face and feet. No pains in extremities. A twin pregnancy. Second child born four hours after first. She had a severe spasmodic cough throughout the last three months.

Present pregnancy: Last period November 3, 1928. A feeling of weakness in the legs was noted during the second month, with aching pains in the legs, knees, and later in the ankles. In the arms (wrists, chiefly) a feeling of numbness preceded milder aching pains. Mild headaches were frequent. Edema of the hands and feet was moderate and rather variable. Teeth were poor and broke easily. Blood pressure remained at 120/80. Urine negative throughout. She had great difficulty in sleeping apparently due to the aching pains and restlessness. On March 29 she was given parathormone, 30 units. There was intermittent relief, particularly from the cramp-like pains in the extremities and from the edema. Early in May she began taking calcium chloride, 1 teaspoonful 5 times daily. She took this quite irregularly. Up to May 23 she had 5 injections of parathormone, 30 units. With the last dose she had much relief from pain and slept soundly. On May 26

she had severe pains throughout legs and arms, with tenderness to pressure over same area. She was restless, sleepless. Given an injection of parathormone, and $\frac{1}{4}$ gr. codeine. The next day she began taking calcilact, 5 teaspoonfuls daily. On May 29 the parathormone was repeated, 40 units. The edema and restlessness disappeared, and she slept well. By June 2 the edema, restlessness and insomnia were again in evidence. It has been found that in the patient at least 40 units of parathormone at from two- to four-day intervals are necessary to keep her comparatively free from symptoms. The first blood calcium was taken March 29 and was 9.3 mg. The next, on June 14, was 8.53 mg., though she had 30 units of parathormone on June 2, 4, 8, 12, with 40 units on June 14. On June 17 she had 40 units. June 18 the blood calcium was 9.71 mg. Since this heavier dosage had been instituted she remained sufficiently free of symptoms to be able to be comparatively comfortable. On July 5 she noticed, while reading, that it took a moment or so for her eye to accommodate.

CASE 3.—Age twenty-eight years; para ii. She is a strong, healthy woman, living on a farm and doing much hard manual work. Children aged five and three years. First labor lasted thirty-six hours, second eighteen hours. Last period November 2, 1928. Except for moderate frequency and nocturia during the first trimester, she was well until June. Beginning early in that month she had a deep-seated pain in the left thigh. There was occasional pain in the ankles with a feeling that they would not bend and that she could not stand on them. The same aching pain was felt in the hands and wrists, less often in the right shoulder. Occasional numbness in hands and feet "as though they were going to sleep." Insomnia troubled her greatly; this, together with a growing irritability, was quite unusual with her. Edema was slight and occasional. Tender varicosities under right knee and upper calf, though small, had deep bluish discoloration. She was given calcilact, 1 teaspoonful 5 times daily. She was seen again July 1. The cramps had continued, together with the other symptoms, unabated. She was given 40 units of parathormone and directed to take irradiated ergosterol, 5 drops twice daily. On July 4 she wrote to say that she was completely free from the pains and that she slept soundly and felt better in every way.

CASE 4.—Age twenty-one years; para i. During her first pregnancy, at four and one-half months, she had insomnia and edema of the hands, face and feet over a period of five days. This disappeared spontaneously, and the patient remained comfortable throughout the rest of her pregnancy. Urine free of albumin throughout, blood pressure varied from 112 to 116 over 80. Labor was long; second stage terminated by low forceps delivery because of increasing exhaustion of the patient and gradual loss in effectiveness of the contractions. Postpartum progress was uneventful. She became pregnant again four and one-half months later (present pregnancy). At the sixth month (June 26) she began having cramp-like pains in the thighs and legs with mild paresthesias in the flanks. She slept well, however, but complained of being tired. No headaches; bowels moderately constipated, moderate edema of feet. Urine negative for albumin. She was given calcilact, 1 teaspoonful 4 times daily, and 10 minims daily of irradiated ergosterol. Two days later she reported that the cramp-like pains had left, as had the paresthesias. She no longer felt so tired, and looked forward to her vacation with more interest. (At this writing she is away on her vacation.)

CASE 5.—Age twenty-six years, a strong, healthy appearing woman. She has been married six years, and, though wishing for children, was childless. Menses began at eleven years, regular twenty-eight-day type, duration four days, moderate flow, severe cramp-like pains on the first day referred down the thighs. She remarked about feeling sleepy most of the time, and of her ability to fall asleep at

a moment's notice. An examination was essentially negative. She was given thyrovarian tablets, 5 gr., 4 times daily. She was next seen five months later and was found to be four months' pregnant. Progress was uneventful until the last month when her faculty of easy slumber was lost. She had cramp-like pains in the right groin. There was a small amount of edema. No headaches. Urine negative. Blood pressure 128/82. She was given calcilact, 1 teaspoonful 4 times daily. The cramp-like pains ceased; she slept better. Labor began at term and lasted fifteen hours. Pains strong and regular. Low forceps delivery because of extended second stage. No tears. Third stage uneventful. Puerperium normal.

CASE 6.—Age thirty-four, para iv. Throughout her first pregnancy she had nausea and vomiting. She had severe cramp-like pains in the legs throughout most of the period, much edema with a gain of 60 pounds in weight, insomnia, and irritability. Labor was induced with quinine, castor oil, and pituitrin because her physician thought she was over term and her size was such as to prevent her from walking. Labor lasted four and one-half days, during which her pains were strong on the first and last day but rather mild during the others. Delivery was effected by low forceps. The second pregnancy was uneventful; there were no cramp-like pains, very slight edema, no insomnia, and she felt well throughout. She was on a low calorie diet throughout this pregnancy, weighing 120 pounds at delivery. Her only complaint was constipation, requiring medication throughout, whereas, in her first and fourth pregnancies normal bowel movements occurred regularly. Labor lasted twelve and one-half hours. Delivery was spontaneous; the child weighed 7 pounds, 11 ounces, just 11 ounces more than the first. Her third pregnancy, one and a half years before, terminated in a right tubal abortion at three months. The tube was removed. Recovery was uneventful. Her fourth pregnancy terminated July 10 with the spontaneous delivery of identical male twins. The last two months of this pregnancy were characterized by the same symptoms as she had in her first; the edema, though considerable, was less than with the first, the cramp-like pains involved the hands and arms as well as the feet and legs, the insomnia was the same as with the first, as were the irritability of disposition and the emotional instability. Paresthesias of the hands were remarked about frequently. The edema involved the lower and upper extremities and the face. Urine negative for albumin. Blood pressure 120/80. Bowels normal. She had occasional nausea and vomiting, up to the night before delivery. During this pregnancy she gained 45 pounds in weight. On June 20 she was given calcilact 1 teaspoonful 3 times daily. There was but little relief. One week later she was given 40 units of parathormone. There was no relief for twenty-four hours, but at the end of that period there was an almost complete subsidence of the edema, she slept soundly, her irritability was less, and the cramp-like pains and paresthesias left her. Three weeks before term she had a partial spontaneous rupture of the membranes with constant leakage of amniotic fluid; after three days labor began, with strong, regular, frequent pains. The first of the twins delivered in the R.O.A. position, and second as an S.L.A. The second weighed 4 lb., 13 oz. The first was the smaller of the two; it died after one and a half hours; probable cause was atelectasis (no autopsy). Duration of labor, four hours. The second twin survived. Postpartum progress uneventful.

CASE 7.—Age thirty years, para i. Dysmenorrhea accompanied the menses since their beginning. She had hay fever each spring up to 1916 when it stopped following a year on the West Coast. Three years before (one year before her first pregnancy) she began having twitching sensations in the legs and arms. Paresthesias and restlessness began at the same time. She always had frequent headaches. One sister died of diabetes, two brothers were living and well. Her first pregnancy, two years before, was similar to the present one. She had nausea

and vomiting constantly throughout, in spite of a great variety of treatments; she lost 15 pounds in weight. I saw her on January 31, 1929. She was about six weeks pregnant and complained of severe nausea and vomiting, pain in epigastrium, headaches, shortness of breath. Up to recently she had been under treatment for a duodenal ulcer. There was some cardiac irregularity. Consultation was asked, and it was decided that her condition did not warrant an interruption of pregnancy. For this examination she was in the hospital for three days. Urine negative. Hgb. 76, pulse 100. She was next seen on June 1. She had been vomiting daily with occasional four- to six-day periods when vomiting would be severe. She had had a frontal sinus infection which was now clearing up. At this time she began to have severe twitchings in legs and hands. She found it almost impossible to sleep and was becoming extremely irritable and restless. She was given calcilact and irradiated ergosterol. There was no change in the nausea and vomiting during the next three weeks. Headaches were rather frequent. Bowels normal. Her sleep and restlessness were slightly, if at all, improved. She was started on parathormone, 40 units twice weekly. On July 1 her blood calcium was 8.5 mg. The twitching of the calves and forearms continued. On July 14 she was given calcium chloride intravenously, 15½ gr. in a 10 c.c. solution. There followed definite relief from the twitching and cramp-like pains. She felt more relaxed, but the nausea and vomiting were not affected. It is a question with this patient whether there was any absorption of the calcium taken by mouth; often it was vomited, and at other times she said she felt too sick to take it.

CASE 8.—Age thirty years, para iii. Menses began at twelve years; regular twenty-eight-day type; flow profuse, lasting five to six days. There were cramp-like pains during the first two to three days, and usually nausea the first day. First pregnancy at twenty years. Normal throughout. Labor lasted three days, terminating in instrumental delivery. During puerperium she had a breast abscess which was drained. Her second pregnancy was seven years later. Throughout she had cramp-like pains in the right foot, leg, and thigh. There was edema in both lower extremities. Numerous injections of morphine were given to control the pain in the lower extremities. She was seen three days postpartum following her third pregnancy (July 13). She had backache, severe cramp-like pains in feet, calves, and knees throughout, together with paresthesia of feet. Paresthesia in hands appeared only after delivery. She had edema of both lower extremities throughout. She was irritable and cried easily. Her labor lasted seventeen hours, of which sixteen and a half hours were taken up in the first stage. Delivery was spontaneous. The symptoms which she had throughout pregnancy seemed to increase in severity after delivery. On the third day she was fretful, her legs were edematous, she had severe cramp-like pains in the lower extremities and paresthesias in the feet and hands, and she found it almost impossible to sleep. On the afternoon of the third day postpartum she was given 40 units of parathormone intramuscularly, followed in six hours by 15½ gm. of calcium chloride in a 10 c.c. solution intravenously. Within fifteen minutes of the calcium injection she began to feel better. She slept soundly all night, and the next day the edema had completely disappeared, the pains likewise, and she appeared calm and cheerful in contrast with her harassed manner of the preceding days.

CONCLUSIONS

1. It is reasonable and useful to consider the symptoms of aching or cramp-like pains in the extremities, insomnia, irritable disposition, moderate edema, and paresthesias as a syndrome having its pathogene-

sis in a disturbance of calcium metabolism and producing in the individual a tetanoid state.

2. Treatment of this syndrome by measures tending to improve the calcium metabolism results in an amelioration of the symptoms.

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THE PROGNOSIS OF HEART DISEASE IN PREGNANCY*

BY WILLIAM D. REID, M.D., BOSTON, MASS.

THERE appears to be a difference of opinion in the published statements of various observers as regards the prognosis of organic disease of the heart in pregnant women. Likewise, there is a considerable difference in the statistics on the mortality of cardiac disease complicated by pregnancy, or vice versa. It is the purpose of this article to review some of the literature on this subject and to present additional statistics. The study was undertaken with the object of obtaining, if possible, a more satisfactory estimate of the approximate prognosis of heart disease in pregnancy.

CERTAIN BOSTON STATISTICS

A recent report states¹ that nearly 20 per cent of the maternal deaths at the Boston Lying-In Hospital in a four-year period and 28 per cent of the maternal deaths at the Faulkner Hospital, Boston (private obstetric wing), in a seven-year period were furnished by patients with seriously injured hearts.

TABLE I. PROGNOSIS IN CLASS I PATIENTS BOSTON LYING-IN HOSPITAL

YEAR	NUMBER OF CASES	NUMBER OF DEATHS	DEATH RATE
1922	33	7	21.2%
1923	37	6	16.2%
1924	35	3	8.6%
1925	35	1	2.8%
1926	40	2	5.1%
1927	72	2	2.7%

*From the Evans Memorial, and Boston University School of Medicine. Report of a clinic before the American College of Physicians, Boston, April 11, 1929.

These observers publish an interesting table (Table I) on the prognosis of Class I patients. Their description of the selection of patients from whom these statistics were gleaned is as follows: "Class I contains patients with severely injured or disordered hearts. With very few exceptions, they are so classified because they have a considerable enlargement of the heart, or a diastolic murmur, or both. A very few have been grouped in Class I because of a very loud or harsh systolic murmur accompanied by a thrill, with usually additional minor signs of an injured heart, or because of serious disorder of the heart-beat without other signs of an injured heart."

An analysis² of 53 patients with organic heart disease, all of the rheumatic type, referred from the Boston Lying-In Hospital to the Cardiac Clinic of the Massachusetts General Hospital, in the years 1920 to 1922, showed but two deaths or a mortality of 3.78 per cent. In one of these patients there was an acute endocarditis, superimposed upon a chronic infection (mitral stenosis and aortic regurgitation), and in the other auricular fibrillation complicated mitral stenosis. The former survived a vaginal cesarean section at four months, but died one month later at home. The latter died a few hours postpartum. These statistics, as pointed out by the authors, may not be properly comparable with those pertaining to the general prognosis of cardiac disease in pregnancy as the patients were all ambulatory.

In a study³ of the statistics pertaining to the mortality in pregnancy in the entire state of Massachusetts, it was found that cardiac disease was the cause of death in 6.2 per cent of the deaths of primiparac and 7 per cent of those of multiparac.

MORTALITY FROM CARDIAC DISEASE AT THE ROBINSON MEMORIAL*

M. Courtiss has recently analyzed the records of the Robinson Memorial and in Table II are given the data pertaining to the deaths from cardiac disease from 1916 to 1927. There were but 9 such deaths in 19,237 deliveries making a percentage of 0.046. The maternal mortality from all causes was 225, or 1.15 per cent. The cardiac mortality when related to that from all causes was 4 per cent. It is noteworthy that at no time has the mortality from cardiac disease been higher than 15 per cent (in 1921).

MORTALITY IN TWO BOSTON AND ONE NEW YORK HOSPITALS

The relation of the mortality from cardiac disease to that from all causes during the years 1921 to 1927 inclusive is given in Table III. The deaths attributed to cardiac disease comprised 17.2 per cent of the total mortality in the Boston Lying-In Hospital, 8.1 per cent in the New York Lying-In Hospital, and 5.1 per cent in the Robinson Memorial. The number of deliveries in the New York institution ex-

*The Obstetrical Department of the Massachusetts Homeopathic Hospital.

TABLE II. STATISTICS FROM ROBINSON MEMORIAL

	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	12 years
Number of confinements	1,539	1,452	1,823	1,595	1,627	1,552	1,530	1,547	1,658	1,718	1,703	1,673	19,237
Living infants	1,306	1,416	1,760	1,530	1,572	1,496	1,463	1,508	1,610	1,676	1,659	1,640	18,636
Stillbirths	64	47	63	67	55	52	63	54	63	57	60	54	699
Miscarriages	10	2	4	5	3	18	16	16	17	17	8	15	131
Infant deaths prematurity	20	11	21	19	13	11	25	15	18	26	6	0	185
Mothers' deaths	16	20	26	20	27	20	19	22	10	7	21	17	225
Maternal deaths cardiac	0	0	1	2	0	3	1	1	1	0	0	0	9
Induced labor	5	1	5	4	7	7	26	48	71	60	43	38	315
Abdominal sections	43	24	40	43	52	60	63	74	73	82	96	132	782
Sterilization						1	7	8	14	5	3	0	38

TABLE III. MORTALITY IN TWO BOSTON AND THE NEW YORK LYING-IN HOSPITALS

YEAR	DELIVERIES			MATERNAL DEATHS			PERCENTAGE MATERNAL DEATHS TO DELIVERIES			CARDIAC DEATHS			PERCENTAGE CARDIAC DEATHS TO DEATHS FROM ALL CAUSES		
	B	N	R	B	N	R	B	N	R	B	N	R	B	N	R
1921	909	3,093	1,552	13	45	20	1.5	1.4	1.2	7	6	3	41.1	13.3	15
1922	758	3,511	1,530	17	31	19	2.2	0.8	1.2	6	4†	1	25	12.9	5.2
1923	1,052*	3,370	1,547	24	25	22	2.2	0.7	1.4	3	3	1	13	12	4.5
1924	1,329	3,813	1,658	23	24	10	1.7	0.6	0.6	3	2	1	6.6	8.3	10
1925	1,631	3,662	1,718	15	41	7	0.9	1.1	0.4	1	2	0	11.1	4.8	0
1926	1,715	3,593	1,703	18	35	21	1.5	0.9	1.2	2	2	0	11.1	8.5	0
1927	1,925	3,648	1,673	12	41	17	0.6	1.1	1.0	2	1§	0	16.6	2.4	0
Totals	9,319	24,690	11,311	122	242	116	1.3	0.98	1.0	21	21†	6†	17.2	8.7	5.1
		45,320			480			1.09			48			10	

*The increase in the annual number of deliveries is explained by the opening about 1923 of the new and larger hospital plant.

†One from malignant endocarditis.

‡Contains statistics for one more year (1921) than the Boston Lying-In. If this is omitted the percentage of cardiac deaths to those from all causes is reduced to 7.6 per cent in the New York Lying-In, and 1.5 per cent in the Robinson Memorial.

§Myocarditis and Pott's disease.

ceeds by over 4,000 that of the two Boston Hospitals combined. The total for the three clinics is 45,320 deliveries, 480 deaths from all causes, and 48 from cardiac disease. This gives 10 per cent as the relation of the cardiac disease to the total mortality.

RECENT LITERATURE

Jakowleff⁴ records a mortality of 25 to 27 per cent in pregnant women with the combination of mitral stenosis and insufficiency. However, he expresses himself less pessimistically when he states his opinion that patients with all varieties of valvular heart disease, even if cardiac insufficiency is present, are in general able to go through parturition if the insufficiency of the heart is not very pronounced or of long standing and if the delivery is conducted with all care.

Pardee, consulting cardiologist to the New York Lying-In Hospital, estimated⁵ the mortality of the cardiac patients to be about 26 per cent for severe cases and 10 per cent for all cases. More recently Pardee reports⁶ 112 cases with a total mortality of 6 or 5.3 per cent, and 4 or 23.5 per cent of the 17 classified as serious (11 were Class IIb, and 6 Class III). One of the patients whose cardiac disease was classified as nonserious died of pneumonia, and the other following amputation of the leg for gangrene resulting from embolism. All six of the serious cases (classified as in Group III) were in a grave state when brought to the hospital by ambulance. Two died immediately after entrance into the hospital, and a third died forty days after delivery by vaginal section. The fourth case (Class IIb) died a cardiac death. Pardee properly emphasizes that the six emergency cases should have been brought to the hospital before their condition had progressed to so serious a state.

Nelius⁷ and Jensen⁸ both state that it is well-nigh impossible to foretell the outcome when a woman with heart disease becomes pregnant; the former points out that a patient with grave cardiac insufficiency at one pregnancy may have no trouble during the next one.

A South American observer⁹ contributes a very favorable report. All of his 37 patients with heart disease passed through pregnancy successfully and now have a total of 114 children. Sir James Mackenzie¹⁰ was bold enough to assert that there is no single sign shown by the heart itself, however abnormal it may seem, that should be a bar to pregnancy.

Hay and Hunt¹¹ report 50 cases with 5 deaths. Four of these were complicated by acute nephritis, which was proved to be present in the two in which a necropsy was obtained. They state that experience has shown that the majority of women with crippled hearts, in whom the cardiac reserve is good, are capable of pregnancy and labor without any great additional risk.

Combining the statistics found in the literature cited, gives (Table IV) an average mortality from cardiac disease of 8.1 per cent of the mortality from all causes. Applying the mortality rate of 1.09 per cent for deaths from all causes (Table III) in the three hospital clinics gives 1090 deaths per 100,000 deliveries. Eight and one-tenth per cent of these, or 88.2 women would have died due to heart disease. In comparison with this it is calculated¹² that 55.5 individuals per 100,000 population between the ages of twenty to thirty-nine years in the first 10 U. S. registration states and District of Columbia in 1920 died of cardiac disease. This 55.5 deaths includes men, and married and unmarried women.

TABLE IV. CARDIAC MORTALITY REPORTED IN LITERATURE

SOURCE	CASES	PERCENTAGE MORTALITY	PERCENTAGE OF ALL DEATHS
Boston Lying-In ¹	528	3.9	17.2
White and Breed ²	53	3.78	
De Kruif ³			6.6
Robinson Memorial			4.0
Pardee ⁵	50	8	12.9
Pardee ⁶	112	5.3	
Salaberry ⁹	37	0	0
Hay and Hunt ¹¹	50	10	
Total	830	5.1	8.1

COMMENT

In another publication¹³ the writer points out that the vast majority, in fact, well over 90 per cent, of the cases of organic heart disease found in pregnancy are of the rheumatic type. This is in agreement with other observers. The average age at death of patients affected by rheumatic heart disease, according to the available statistics, is thirty-five and five-tenths years. Of more importance, however, is the presentation of evidence which supports the conclusion that pregnant women with cardiac disease die before their time because of the natural evolution of rheumatic heart disease rather than because of pregnancy and parturition.

It may be pointed out that the mortality from heart disease in the Massachusetts statistics is but 6 to 7 per cent. The patients from whom the figure is obtained come from the entire state of Massachusetts and, of course, cannot be said to have had the special care such as was given the cardiac cases in the three hospital clinics whose mortality statistics have been cited. The obstetric clinic of the Robinson Memorial depended upon the casual consultation with a group of internists until 1924, when the services of a cardiologist became available. This cardiologist (the writer) is not conscious that he has prevented the death of more than a small number of patients. The cardiac mortality was but 9 patients, or 4 per cent of the total mortality, for

the entire period of twelve years in our hospital. In view of the statistics given in our Table III it is surprising that nearly 20 per cent of the maternal deaths at the Boston Lying-In Hospital in a four-year period and 28 per cent of the maternal deaths at the Faulkner Hospital, Boston (private obstetric wing), in a seven-year period, were furnished by patients with seriously injured hearts.

It is pointed out that in dealing with such a small number as the cardiac deaths in any one year, in the three hospitals whose statistics are given in Table III, the percentage changes unduly if but one or two more patients die. Doubtless attention should be directed mostly to the totals for the seven years.

Attention is directed to the fact that the statistics from the Boston Lying-In Hospital are higher in Table III than in Table I, since the mortality rates are derived differently. In fact the figures are not truly comparable between these tables and likewise those of Table I (Boston Lying-In Hospital) are not comparable with those of the New York Lying-In Hospital or Robinson Memorial, given in Table III.

Apparently there is also a great difference in the number of cardiac patients found in these three hospital clinics. In Table V it is shown that the Boston Lying-In Hospital reports cardiac cases to be 6.2 per cent of the total deliveries, whereas there were but 1.0 and 0.7 per cent, respectively, in the New York Lying-In Hospital and Robinson Memorial. At the Boston Lying-In Hospital 47.9 per cent of the cardiac patients were classified as serious (i.e., their Group I) whereas but 15.1 per cent of those in the New York Lying-In Hospital were deemed to be serious. The percentage of serious cardiac cases reported from the Boston Lying-In clinic when related to the total delivery count is 2.99, which makes it three times the entire cardiac group, serious and nonserious, in the New York clinic and four times that in the Robinson Memorial. (It is regrettable that the records at the Robinson Memorial are not readily available for analysis as to severity of the heart disease. However, since the mortality during these years [see 1925 to 1927 in Table III] was zero it is reasonably certain that they were not all serious.)

TABLE V. CARDIAC MORBIDITY IN THE THREE HOSPITALS

HOSPITAL	PERIOD	DELIVERIES	CARDIAC PATIENTS			
			TOTAL	PERCENTAGE OF DELIVERIES A	SERIOUS	PERCENTAGE OF CARDIACS B
B. L. I.	1922-27	8,410	528	6.2	252	47.9
N. Y. L. I.	July 1923- July 1925	7,860	112	1.0	17	15.1
R. M.	1925-27	5,271	40	0.7		

A. Cardiacs in relation to total deliveries.

B. Percentage of cardiacs classified as serious.

It may be that the Boston Lying-In Hospital is receiving an unusually large group of serious cardiac cases, or else that the clinic is being so carefully studied that more cases are discovered. The latter appears to be the more probable, in my opinion, and perhaps at least in the Robinson Memorial some of these cases pass through without recognition of the cardiac complication. I doubt if this be true of serious cases, and in support of this is the favorable mortality shown in Table III.

It is possible that there is a difference in the making of the diagnosis of cardiac disease in these three hospital clinics. That such is more than theoretically possible is suggested by the work of Gammeltoft¹⁴ of Copenhagen. He studied carefully 239 perfectly healthy pregnant women and found that during the final two months of pregnancy 39 or 16.3 per cent showed findings which suggested organic disease of the heart. These findings were: rapid pulse, extrasystoles, visible venous pulsation, and systolic and diastolic murmurs at the base of the heart and over the pulmonic and tricuspid valves. In no instance could these findings be detected four weeks after parturition. Gammeltoft writes, "I do not doubt that quite a number of cases of functional heart disturbances are included among the cases of heart disease which are treated in obstetric clinics everywhere. This in turn means that statistics will vary a good deal."

It becomes evident that in comparing the statistics of the three hospitals (Tables I, III, and V) the matter of classification of the patients is important. Hamilton and Kellogg¹ state that they classify their cardiac patients chiefly on the basis of the structural change deemed to be present. The description of their Class I quoted above, and study of their paper makes it apparent that this group contains nearly all the patients in whom organic disease of the heart could be definitely diagnosed. They state that their method of classification has proved valuable to them in that their Class I included all the cases in whom cardiac insufficiency developed or death resulted. In the matter of classification, Hamilton and Kellogg differ from the opinions and practices of others^{2, 5, 6, 9, 11, 15} who state that the only valuable classification is that based upon the degree of cardiac insufficiency.

Even when using the latter basis of classification of cardiac patients who are pregnant, it is possible for the personal equation of the individual physician to affect the statistics. One physician may deem the degree of cardiac insufficiency to be of greater severity than would another. For purposes of uniformity it is believed that the classification of Functional Capacity now made official by the American Heart Association should be followed. For the information of those who are not familiar with this classification it will be repeated here.

FUNCTIONAL CAPACITY

1. Patients with organic heart disease, able to carry on ordinary physical activity without discomfort.

2. Patients with organic heart disease, unable to carry on ordinary physical activity without discomfort.

a. Activity slightly limited.

b. Activity greatly limited.

3. Patients with organic heart disease and with symptoms or signs of heart failure when at rest, unable to carry on any physical activity without discomfort.

The time in pregnancy when cardiac insufficiency appears and its response or lack of response to therapy are important factors affecting prognosis. In general it may be stated that the prognosis is less favorable the earlier in pregnancy the heart failure appears. If the response to treatment is not satisfactory, recourse to operative interference before the failure has progressed to a severe degree will improve the results. It is emphasized that the treatment should be adequate; that is, a sufficient degree of rest and the administration of digitalis in a dosage that produces the definite action of the drug. These matters have been sufficiently discussed elsewhere.¹³

In view of the statistics cited from the literature and reported from the three hospital clinics, it does not appear warranted to accept the gloomy opinion, apparently held by many physicians of the prognosis of heart disease in pregnancy. So long as the response to effort is satisfactory and there is no undue enlargement of the heart, the presence of valvular disease is no bar to marriage or pregnancy. Are not Hay and Hunt¹¹ correct when they assert that motherhood is woman's peculiar privilege and prerogative, a privilege which we have no right to refuse without adequate reason? It is my personal opinion that there is too little faith in the heart's ability to carry on and too much radicalism in the treatment of cardiac patients who are pregnant.

SUMMARY

There appears to be a considerable difference in the published statistics of the mortality of cardiac patients who are pregnant.

Cardiac disease is stated to have accounted for nearly 20 per cent of the total maternal mortality during a four-year period at the Boston Lying-In Hospital and for 28 per cent of the deaths during a period of seven years at the Faulkner Hospital.

In Table I are given some interesting statistics already published by Hamilton and Kellogg.¹

The deaths from cardiac disease were but 4 per cent of the mortality from all causes at the Robinson Memorial for a period of twelve years

(1916 to 1927); for the entire state of Massachusetts organic disease of the heart accounted for 6 to 7 per cent of the mortality in parturition.

Analysis of 830 cardiac patients who were pregnant reported in the literature discloses a mortality of 5.1 per cent. The cardiac deaths comprised 8.1 per cent of the deaths from all causes during pregnancy and parturition.

Statistics from the Boston Lying-In Hospital, New York Lying-In Hospital, and the Robinson Memorial when combined show 45,320 deliveries, 480 deaths from all causes, and 48 deaths from cardiac disease. The cardiac mortality amounts to 10 per cent of the deaths from all causes. This indicates that about one mother died for each 100 deliveries, and that but one in 1000 parturients died from organic disease of the heart.

The difference in various published statistics is discussed and it is suggested that the method of classifying the patients is of significance. The majority of recent observers classify their cardiac patients according to the degree of insufficiency of the heart rather than according to the structural lesions diagnosed.

Prognosis is affected by the care given and the skill used in the treatment of the individual patient.

CONCLUSIONS

The mortality of cardiac disease in pregnancy varies from zero to about 20 per cent, with an average of perhaps 5 to 10 per cent. This indicates that 90 per cent or more survive.

Classification of the cases according to the degree of cardiac efficiency is the most valuable guide to prognosis and treatment.

Undue pessimism as regards the prognosis of all cardiac patients who are pregnant is not justified by facts; there appears to be too little faith in the ability of the heart to withstand pregnancy and parturition.

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POSTOPERATIVE CHANGES IN THE LIBIDO FOLLOWING STERILIZATION*

BY JOHN VRUWINK, M.D., AND PAUL POPENOE, D.Sc., LOS ANGELES,
CALIF.

IN AN uncomplicated operation for sterilization, no organ should be removed, and, provided no damage is done to the ovarian circulation, no radical changes are made in the blood supply or innervation. Aside from incidental results of laparotomy, therefore, the only consequence of such operation should be the precluding of conception. Any effect on sexual activity would be due to psychologic, not to physiologic, factors.

Opinions to the contrary are probably due in most cases to ignorance of the patient's sexual life prior to operation. If a woman states after sterilization that she has no sex feeling, and if the surgeon records this fact, without taking the trouble to find out whether she had sexual feeling before the operation, he may easily be led to conclude that the resection of the fallopian tubes had a prejudicial influence on the libido. The importance of this factor will be realized when it is recalled that at a given time, at least one married woman in four or five will state that coitus is either indifferent or distasteful to her. The question of frigidity, in general, has received less attention than it deserves, and most of the data available, being derived from the records of gynecologists, may be misleading because the gynecologist's patients are often not normal women.

The most satisfactory evidence on this point is furnished by the results of a questionnaire sent to 1,000 educated married women by Katharine Bement Davis. Referring to their entire married life, 6 per cent of these women reported themselves as neutral, 3.5 per cent as antagonistic to coitus, a total of 9.5 per cent; but at the time of the report, the neutral comprised 18 per cent, the distasteful 12 per cent of the group: in other words, 30 per cent would have stated that they found no satisfaction in the marital relation.

R. L. Dickinson, M.D., secretary of the Committee on Maternal Health, New York, has very kindly gone over some of the records of his former practice and furnished us with the following results: Of 664 married women, few were without sex feeling at some time in their lives, but at the time of report, various degrees of frigidity plus persisting distress in intercourse were reported by 26 per cent. Six reports in the medical literature (not including Matthews Duncan) ex-

*Read at a meeting of the Los Angeles Obstetrical Society, May 14, 1929.

amined by Dr. Dickinson, averaged about 15 per cent. Havelock Ellis in his well-known survey concluded that the proportion of frigid wives was somewhere between 10 per cent and 25 per cent.

For the literature, then, a rough estimate would be that at any one time about 20 per cent of married women would report that they found no pleasure in sexual intercourse. It is to be noted that the literature deals mainly with an earlier generation. It is possible that conditions are growing worse in this respect, with the increasingly artificial nature of civilization and the present tendencies in the education of young women. At any rate, the figures found by both Dr. Dickinson and Dr. Davis are above 20 per cent.

In our own material, shortly to be described, definite statements are available from 177 patients as to their sexual life prior to sterilization. They are divided as follows:

	NUMBER	PERCENTAGE
Pleasurable	134	75
Neutral	28	15
Distasteful	15	10
Totals	177	100

We conclude that among American married women of the present day, so far as the available data indicate, at least one in four will report herself as indifferent or antagonistic to coitus. This is a finding which must be borne in mind by anyone who studies such a problem as that of the effect of sterilization.

Since the rise of official eugenic sterilization, which dates from 1907 in the United States, and from 1909 in California, resection of a portion of the tube has been the procedure relied upon almost exclusively, and a knowledge of its effects has therefore become all the more important. In the California state institutions for the mentally diseased and mentally defective, 2827 women had been sterilized up to January 1, 1929.

E. S. Gosney, a Pasadena philanthropist, has had under way for four years a comprehensive study of the results of the workings of the California eugenic sterilization law* and, to provide a parallel study, he asked the Los Angeles Obstetrical Society to undertake an examination of the sterilizations performed in private practice, nearly all of which are primarily therapeutic, rather than eugenic, in purpose. At a meeting of the society on October 12, 1926, it was voted to accept Mr. Gosney's offer to provide financial help for such a study, and Drs. N. N. Wood, E. J. Krahulik and John Vruwink were appointed a committee to conduct it. Details of 420 cases have been gathered,

*The findings have been published in a score of technical papers in scientific journals, a list of which can be secured from the office of E. S. Gosney, 26 N. Maringo Avenue, Pasadena, Calif., and have been summarized in a popular book, "Sterilization for Human Betterment" by E. S. Gosney and Paul Popenoe.

thanks to the cordial cooperation of a large number of members of the profession.† A full report of these is being published elsewhere; the present paper deals only with the effect of sterilization on the sexual life. For this purpose details were gathered either through personal inquiry by the surgeon, through correspondence, or by the use of a field worker who visited the patients in their homes, and the data thus gotten were tabulated and analyzed by Paul Popenoe, who has been in charge of the biologic research involved in Mr. Gosney's study.

As stated above, this part of our report is based on 177 women who gave satisfactory information about their sexual lives before and after the operation. These women were, with two or three exceptions, all of childbearing age, averaging a little less than 35 years at the time of operation. They were nearly all of American or North European birth, only a few being Mexicans. As many of the cases were complicated by hysterectomy, removal of one ovary or both, or other major surgery, the simple salpingectomies, 105 in number, were studied separately. The report of patients as to libido, correlated with the number of years that had elapsed since the operation, is given in Table I.

TABLE I. REPORT ON SEXUAL LIFE SINCE SALPINGECTOMY, BY NUMBER OF YEARS ELAPSED SINCE OPERATION

NUMBER OF YEARS	DECREASE	NO CHANGE	INCREASE	UNKNOWN	TOTAL
0-4	3	52	27	6	88
5-9		5	7		12
10-		3	2		5
Totals	3	60	36	6	105

The six listed as unknown were unable to make a report, either because they had not lived with their husbands since the operation, or because they had not yet recovered from the effects of the operation enough to resume marital relations. Excluding these, it will be noted that more than one-third reported increased sexual satisfaction (which most of them explained, no doubt correctly, as due either to improved general health, or removal of fear of pregnancy, or both), and all the rest saw no change, with three exceptions.

Of these three, one suffered from a hypertrophic elongation of the cervix which made coitus painful but obviously had nothing to do with the salpingectomy; a second, who has a history of numerous eurentages for abortions, had both tubes removed because of chronic salpingitis. She had previously suffered from pelvic pain with leucorrhoea and prolonged dysmenorrhoea; since the operation she has again become in-

†The foundation of this study was a series of patients operated upon by members of the staff at The Los Angeles County General Hospital, and of reports of private patients furnished by members of the Los Angeles Obstetrical Society and a few others. F. L. Herrick of Napa State Hospital contributed a series of cases from his former private practice in Oakland, Calif. We are particularly indebted to two eastern colleagues, George Gray Ward for sending us a number of records from the Woman's Hospital, New York City, and Edward L. Cornell for a large series of reports from the Chicago Lying-in-Hospital.

feeted with the gonococcus; she reports that coitus is painful, but this is not surprising in view of her history. The third was sterilized after a first cesarean section, because of contracted pelvis; she is well pleased to have been sterilized but reports that she has less sexual desire than before. There is no obvious reason for this, but in the light of the figures presented at the beginning of this paper, concerning the changes that take place in the libido of many unoperated women, there is no reason for surprise in an occasional report of diminished libido. The cause could only be found, if at all, by a thorough study of the patient's physical and emotional life.

From these figures we conclude that salpingectomy produces no change of a physiologic nature in the sexual life. For psychologic reasons it may frequently be followed by an improvement.

The report of 60 women who had other major surgery (usually hysterectomy or hysterotomy) done concurrently with salpingectomy, did not differ materially from the figures already given.

Of the remaining 12 patients in our 177, the type of operation was not stated in one case. One reports her sexual life greatly improved after menopause induced by radium. Two others, following sterilization by x-ray for metrorrhagia, report total loss of sexual feeling. There are eight cases of bilateral oophorectomy of whom one had had no opportunity to test the results; one reported an increase, one a decrease, and five no change in the libido.

While these figures as to the results of castration are too small to have any significance, they do not seem to be out of line with the findings of other writers. Dr. R. L. Dickinson, who has recently gone over the literature on this subject, has generously furnished us with a summary of his unpublished findings, based on 857 married women reported by 11 authors, and excluding (so far as the information given makes it possible to do so) those women who had never had sexual feeling. The principal papers consulted by him are given in the list of references following this paper; those that he considers most important are marked with an asterisk. We have added a number of other papers bearing on the subject of our report.

When both ovaries are removed surgically, sex desire and response are lessened or extinguished in about 75 per cent.

When at least one ovary remains after a laparotomy for the removal of uterus, tubes, or ovarian tumor, sex desire is lessened or extinguished in about 25 per cent.

When menstruation is arrested by x-ray or radium, sex desire and response are lessened or lost in about 20 per cent.

To get at the facts more precisely, one would have to study each individual case. The conclusion from the data reviewed by Dr. Dickinson is that the greatest loss of feeling is after 40 or near 20. In healthy women in the prime of life, after some years of marriage, the

sexual function has become so much a part of the entire organism, that it is often but little affected even by such a severe shock as radical surgery of the reproductive organs.

Furthermore, these authors give the impression that when there is an unfavorable result, sex desire and urge are more diminished than is response in coitus.

In the light of all the facts available, the gynecologic surgeon should be justified in assuring his patient that simple salpingectomy will not diminish sexual desire or satisfaction in any way. Hysterectomy has little more effect than simple salpingectomy. Bilateral oophorectomy has more far-reaching effects, but principally in women already nearing the menopause, or in young women whose marital habit is not yet well established. In healthy and vigorous married women removal of the ovaries often produces surprisingly little change, and if the woman's condition is improved at the same time by the correction of pathologic conditions and by removal of the fear of pregnancy, she may report increased sexual desire and satisfaction after surgical castration.

SUMMARY

1. Of American married women at the present time, one in four will probably report that she finds coitus either indifferent or repugnant.

2. Failure to note this fact has been responsible for misinterpretation of findings after sterilization.

3. Bilateral salpingectomy appears to produce, of itself, no effect whatever on the patient's sexual life.

4. Psychologic effect of sterilization, where pregnancy was previously feared, and the correction of pathologic conditions, lead about one-third of the sterilized patients to report that their sexual life is improved after operation.

5. Salpingectomy accompanied by hysterectomy does not appear to produce any greater effect on the subjective sexual life than does simple salpingectomy.

6. Removal of the ovaries produces more frequent change in the libido, yet even this in healthy and vigorous women often results in no alteration of sexual desire or response.

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1136 WEST SIXTH STREET.

THE DETERMINATION OF THE BREEDING RECORD IN COUPLES WITH DISTURBED FERTILITY*

BY GERARD L. MOENCH, M.D., F.A.C.S., NEW YORK, N. Y.

IN ATTEMPTING to determine the actual fertility, or perhaps better, fecundity, of any married couple, one of the most important sources of information is represented by the breeding record of the couple under consideration. The determination of such breeding record is, however, at times extremely difficult. Of course, the number of children a couple have, or have not, must not be accepted as a direct criterion. Part of the difficulty in getting accurate data lies in the fact that some patients willfully make misstatements, whereas others give what they consider to be correct answers, which may be misleading to the examiner. The patient, for example, will state that contraceptives were used, and on close questioning it is found that she takes a plain water douche after intercourse, or perhaps, as in some cases, uses no such measures at all until the next morning after she gets up. Inversely, other women may claim that no contraceptives are being used, and it is finally determined that coitus interruptus is continually practiced. Patient B., Clinic No. 468, was a case in point. This woman had not been pregnant in four years, due as she claimed to coitus interruptus. At the same time, according to her statements, this practice had been carried on ever since the birth of her first child, despite which fact she had been pregnant eleven times in eleven years, so that little value can be attributed to the contraceptive measures employed in this case.

Aside from all these considerations, there are, however, other much

*See in this connection also "A Consideration of Some of the Aspects of the Motility of the Spermatozoa"—to appear in the J. A. M. A.

more difficult phases of the problem to contend with. First of all, there is absolutely no standard by which to gauge human fertility. Shall we say that each menstruation is the abortion of an unfertilized ovum and thus contrary to nature, and that a married couple who have natural intercourse once without the woman becoming pregnant the same month, is of lowered fertility? In breeding animals a male is generally bred to a herd of females, and it is relatively easy to determine the fertilizing power of the particular sperms under consideration. In perfectly normal animals, only a fraction over one service per achieved offspring is necessary. In the case of human beings, however, monogamy generally prevails in civilized countries, so that intercourse is repeated again and again by the same partners, and it becomes increasingly difficult to decide who is to blame for the lowered or absent fertility, and even cases with lowered fertility may hope to have children. Thus the fact that a couple has three, four, or even more children does not mean that the breeding record is good, as it may have taken the woman each time a considerable number of months to become pregnant, despite regular natural intercourse. Case 2 and Case 41 of a series of cases of disturbed fertility to be reported on shortly illustrate at least an apparent difference of fertility, even though Case 41 can be called hardly anything but normal. In Case 2 the man was married three times, and each time the wife conceived, despite the use of contraceptives. In two instances pregnancy followed a single "slip." In Case 41 it took two months for the woman to conceive, although no contraceptives were used, and intercourse took place every second day.

Aside from all these factors, we have still to consider that coitus in animals takes place only when the female is in heat, whereas in humans there is no particular time, and some part of the intermenstrual cycle is undoubtedly a sterile period, though the time of this so-called "safe" period probably varies with different women.^{1, 2, 3, 4} In addition, Kurzrok⁵ in a recent article has reported two interesting cases illustrating this point. This "safe" period adds decidedly to our difficulty in determining accurately the breeding record of each case. The fact that some part of the intermenstrual cycle is undoubtedly sterile means that both ovum and spermatozoon have only a limited life, and it is interesting to review the opinions held by different investigators on this subject.

Bryce and Teacher,⁶ for instance, believe that fertilization must occur within forty-eight hours. Long⁷ has shown that in the rat and mouse the ovum lives but twelve hours. Walton⁸ and also Hammond⁹ working with rabbits believe that the ova die in four or five hours. Graf Spee¹⁰ states that the life of the human ovum is unknown, but probably short. Schroeder and Meyer¹¹ on the other hand think that the ovum may live twelve to fourteen days, but offer no proof for their belief and stand rather alone.

However, even if the ovum should be viable for a longer period of time, this does not prove that it remains fertilizable during its entire life. In a number of

the lower marine animals, for instance, the ovum soon becomes nonfertilizable, and a denser solution of spermatozoa is necessary to fertilize an old egg than a fresh egg. Furthermore the egg membrane becomes more permeable with the age of the egg, nature attempting to make the process easier for the spermatozoa, and thus quicker. As for the sperms, though it seems as if the spermatozoa could live indefinitely in the male organs, and Hammond and Asdell¹² have shown that sperms in the epididymis retain their fertilizing capacity for over three weeks, and even up to thirty-eight days, they also found that in the female genitals the sperms did not live over thirty hours. Graf Spee¹⁰ believes that the sperms do not remain unimpaired more than twenty-four to thirty-six hours in the female tract. Crew¹³ has shown that in double matings the fresh sperm has more vigor and is more likely to cause fertilization, and Heape¹⁴ has made similar investigations. Triepel¹⁵ and Mall¹⁶ believe that spermatozoa lose their fertilizing power by the time they have passed the tube. Lillie¹⁷ believes the sperms lose a fertilizing substance, thus becoming ineffective. At the same time, in birds, sperms can live several weeks in the genital tract of the female. In the turkey, for instance, one mating will fertilize all the eggs laid up to about thirty days afterward. Many other observers found fertility up to the sixteenth day in fowls (see references 18 to 26 inclusive). In the duck sterility ensues between the seventh and eleventh day (Chappellier²¹). It must, however, be remembered that in birds the testes are abdominal and thus the sperms not subject to any temperature change, as in mammals, where the inside of the female genital tract is decidedly warmer than the scrotum. Moore and Oslund²⁷ working with rams, found that when the ram's testicles were implanted into the abdomen, degeneration of the tubules took place and azospermia resulted. If the gonads were replaced into the scrotum, spermatogenesis again became active unless the degeneration of the tubules had progressed too far.

The question arises whether men, such as stokers and firemen, especially on steamers, would be liable to disturbed spermatogenesis on account of the great heat in which they work. Personally, I do not believe that this will be found to be true since the men work only four hours at a stretch in the heat of the stokehole. I have attempted several times, while on vacation, traveling as ship's surgeon, to investigate the matter but due to the great sexual promiscuity of this class of men and the prevalence of venereal disease, it was impossible for me to reach any conclusions whatsoever. It would be interesting in this connection to know if the sperms can live longer in the female genital system of those mammals where the male has abdominally situated testicles, as is for instance the case with whales, seals, etc., and at least partly so for the elephant. An exception to the rule that spermatozoa live but a short time in the female genital tract of mammals is found in the bat, where copulation occurs in the fall, and ovulation in the spring. This mammal, however, is an exception in other ways, as the whole of the spermatozoan, head, body, and tail, enters the ovum. Furthermore the bat hibernates, and the consequent reduction of temperature found in hibernating animals may have something to do with the length of time the sperm cells remain alive in the vagina and uterus.

In view of the short life of the ovum and spermatozoa, it is easy to

realize that a careful examination of the sexual habits of any given couple is of prime importance in investigating any case of impaired or absent fertility.

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30 EAST FIFTY-EIGHTH STREET.

R. Schockaert: Removal of the Left Ovary for Sarcoma Followed by a Normal Pregnancy. Bruxelles-med. 9: 483, 1928.

Schoekaert reports the case of a woman twenty-two years of age who presented a tumor rising to the level of the umbilicus. This tumor originated from the left ovary and was connected to the pelvic structure by a definite pedicle. There were no adhesions seen and no signs of metastases in uterus, right ovary, liver, or lungs. In view of the patient's age and desire for children it was decided during operation to leave the other pelvic organs in situ. Histologic examination of the tumor showed it to be a sarcoma of the fusiform type. Four months later the patient became pregnant and at term was delivered of a healthy baby. Two years following the operation the patient was perfectly well and there was no evidence of any recurrence or metastasis.

The author feels that this case is of special interest, first because it shows the advisability of removing only the affected part in cases of ovarian sarcoma when there are no signs of metastasis or adhesions, and second because of the almost immediate occurrence of pregnancy following the operation.

THEODORE W. ADAMS.

THE USE OF THYMOPHYSIN FOR WEAK PAINS IN THE FIRST AND SECOND STAGES OF LABOR

PRELIMINARY COMMUNICATION BASED ON STUDY OF EIGHTEEN CASES

BY JULIUS JARCHO, M.D., F.A.C.S., NEW YORK, N. Y.

(Attending Obstetrician and Gynecologist, Sydenham Hospital; Attending Gynecologist, Beth David Hospital and Home of the Daughters of Abraham; Consulting Gynecologist, Hastings Hillside Hospital)

ALTHOUGH pituitary extract has been employed to overcome uterine inertia and induce or shorten labor, its chief use has been in the second and third stages. Most obstetricians consider it a powerful drug that must be used with caution. It is rarely administered in the early part of the first stage of labor as it may cause too powerful uterine contractions at that time. The effects of various other organic extracts on uterine contractions were studied by Köhler¹ in 1927.

In 1925, at the meeting of the German Gynecological Society, Temesváry² made a brief preliminary report on his experiments with thymus extract and the use of a combination of thymus and pituitary extract in labor. In his 1926 article,³ he described at length experiments on isolated uterine segments, in which he found that thymus extract alone in relatively large doses increases uterine contractions slightly and that this action is much augmented by addition of pituitary extract. Also, the action of pituitary extract on the uterine muscle was prolonged by combination with thymus extract and modified so that the contractions became more rhythmical than with pituitary extract alone.

The action of pituitary extract on uterine muscle appears to be a specific one; that of thymus extract, a nonspecific action. Investigations by Müller and del Campo have shown that, when muscular fatigue is induced by electrical stimulation, thymus extract inhibits fatigue and increases muscular contractions under prolonged stimulation, provided that the muscle is not too greatly fatigued before the thymus extract is used. This observation probably best explains its modifying effect on the action of pituitary extract on uterine muscle.

On the basis of these findings, Temesváry used a combination of thymus and pituitary extracts in one hundred clinical cases to stimulate uterine contractions. In the first few cases, thymus extract was given first and pituitary extract shortly thereafter; but, in most cases, a combination of the two was given.

Of the preparations used, thymophysin proved most effective. It was given by intramuscular injection in doses of 2 c.c. This dose was occasionally repeated, if the action of the first dose was not sufficiently prolonged.

Results in these cases showed that thymophysin is not effective in inducing abortion or premature labor. It proved most active in stimulating uterine contractions in the first stage when pains were weak and labor was not progressing satisfactorily. In this respect it is most valuable, as pituitary extract alone has not proved satisfactory. Thymophysin had no ill effect on mother or child in any case in this series.

Temesváry notes the following as contraindications to the use of thymophysin: markedly contracted pelvis, malposition of the fetus, malformations of the fetus or of the maternal organs, and cardiac or renal disease.

In 1927 Temesváry⁴ reported that thymophysin had been used in about 350 cases under his own observation, generally in the first stage of labor. With a few exceptions, in which the drug was without definite effect, the duration of the first stage and of the entire labor was definitely shortened. Because of the prolonged action of thymophysin, there was no secondary uterine inertia after delivery of the child and the placenta was spontaneously expelled without undue bleeding. With the use of thymophysin the duration of labor in primiparae averaged five to six hours (instead of the usual twenty hours); in multiparae, two to three hours (instead of the usual twelve hours). Thymophysin, Temesváry finds, acts only after uterine contractions have begun. When it fails, the uterine muscle is either exhausted by prolonged labor or rendered adynamic by the action of some toxin.

In 1928 Temesváry⁵ reported the last sixty cases in which thymophysin had been used. In several cases the drug was employed to differentiate true from false labor pains. In three cases it was given to induce premature labor, in two of them with good effect. In these cases thymophysin was given in repeated small doses of 0.2 c.c. each, until weak labor pains started; then a single dose of 1 to 2 c.c. was administered. In fifty-one cases thymophysin was used in the first stage of labor, in only four of which it failed entirely to produce the desired result. In forty cases it showed its full effect in stimulating uterine contractions and hastening delivery. In cases in which labor was prolonged more than five hours, the drug was considered to have a moderately good effect. Thymophysin proved most effective when given early; i.e., as soon as it was evident that the labor pains were weak and infrequent.

Temesváry notes that in most cases he has given 2 c.c. of thymophysin; but, in some cases, only 1 c.c. was the initial dose. He has not observed any ill effect from the larger dose. He does not recommend the use of thymophysin in the second stage of labor, in which he regards unmodified pituitary extract as more effective.

Jahreiss⁶ in 1926 reported six cases in which thymophysin was indicated and used, concluding that its injection when labor has begun but is not progressing, stimulates regular, powerful contractions and shortens labor with spontaneous expulsion of the placenta.

In 1927 Graff^{7, 8} reported 270 cases in which thymophysin had been used. The results were best in the first stage of labor, when, if it was given in the early part, the duration of labor did not exceed three hours. The percentage of successful results was less in those cases in which thymophysin was given at the end of the first stage or in the second stage. When thymophysin failed to relieve the uterine inertia, over 50 per cent of such patients were exhausted by prolonged labor before the preparation was given. It was found also that thymophysin could not be used to induce labor if true labor pains had not begun, and could therefore be employed to distinguish between true and false labor pains.

Graff, as a rule, gave only 1 c.c. of thymophysin, and not over 1.5 c.c. In one case in which 2 c.c. were tried, the uterine contractions were too powerful and the use of morphine was necessary to counteract this condition. He concludes that thymophysin is indicated in primary uterine inertia in the first stage of labor and in cases in which labor has advanced further but uterine contractions have diminished or ceased entirely.

Köhler and Porges¹ (1927) from their clinical findings conclude that thymophysin can be used safely in the first stage of labor, but that the thymus portion of the mixture can be replaced by other organic extracts (ovarian, mammary, and placental). As uterine tetany may occasionally occur with these combined extracts, preparations for combating this complication should be at hand whenever any form of pituitary extract, however modified, is used.

Sachs⁹ in 1927 reported the use of thymophysin in fifty-three cases in the first stage of labor. The indications for its use were failing fetal heartbeat, uterine

inertia, disease or constitutional weakness of the mother, and slightly narrowed pelvis with rigid soft parts. In only four cases was there failure to stimulate the uterine contractions satisfactorily. The drug was without effect in two of three cases of abortion, but very effective in five of six cases of premature labor.

Liebe¹⁰ in 1928 reported the use of thymophysin in one hundred cases, mostly for secondary inertia developing in the second stage of labor. In this group it proved effective in stimulating regular uterine contractions in all but one case, so that delivery was effected by conservative measures. It is to be noted that he differs from the other authorities quoted in advocating its use in the second rather than in the first stage of labor, not finding it superior to other pituitary preparations in the primary inertia of the first stage. In a few abortions it proved effective in bringing about expulsion of the fetus and placenta. Liebe advises small doses of thymophysin, 0.5 to 1 c.c., repeated as indicated.

Oliwer¹¹ in 1928 reported one hundred cases, in fifty-seven of which thymophysin was used in the early first stage of labor for primary uterine inertia and in forty-three in the second stage of labor. In the former group thymophysin induced regular, strong uterine contractions in the majority, with an average duration of labor of three and a half hours in primiparae and twenty minutes to two hours in multiparae. In 10 per cent, forceps delivery was necessary. In the second stage of labor thymophysin usually produced delivery within fifteen to sixty minutes. When effective, thymophysin induced spontaneous expulsion of the placenta in fifteen to twenty minutes after delivery. The dosage was usually 2 c.c., sometimes in one injection and sometimes in two injections of 1 c.c. each at an interval of one hour.

In 1929, Demuth¹² reported 150 cases, in two-thirds of which thymophysin was used for primary inertia in the first stage of labor with early rupture of the fetal membranes. As a 2 c.c. dose produced too prolonged contraction at first, Demuth gave an initial dose of 0.5 to 1 c.c., usually with effect within five to fifteen minutes. If necessary, another dose (not over 1½ c.c.) was given in an hour.

Of the 150 cases, there were only nine failures and thirty-five with weak reactions. If the uterine muscle had been exhausted by prolonged labor prior to the administration of the drug, it was ineffective. If it was rendered quiet for two to three hours with morphine or other sedatives, thymophysin gave satisfactory results. In cases, usually in elderly primiparae, in which thymophysin alone was ineffective, a combination of Klein's method of dilatation with rectal balloons and thymophysin was effective.

Demuth found thymophysin effective in the early first stage of labor with manifest uterine inertia; useful in the second stage, without tendency to tetany; but ineffective in the third stage and not sufficiently prolonged to prevent hemorrhage. Labor was frequently shortened so as not to exceed three to five hours.

USE OF THYMOPHYSIN IN AMERICA

In 1928, Haynes¹³ reported the use of thymophysin in fifty cases, including thirty-three primiparae. He had previously studied Graff's method at the Vienna Clinic.

In thirty-one of thirty-four cases of primary or secondary inertia in the first stage of labor, results were very satisfactory with marked increase in the strength and frequency of contractions in five to fifteen minutes. The shortest period after the injection until delivery was twenty-one minutes; the longest, three hours; the average, one hour and forty-eight minutes. Of five cases in which the patients had passed the expected date by ten days to three weeks, thymophysin produced prompt labor in four. In the entire series of fifty cases, there were four fetal deaths; but none could be attributed to thymophysin.

Haynes concludes that in the first stage of labor the results with thymophysin are "rather amazing" in all types of delayed delivery. He used a 2 c.c. dose, repeated in an hour if indicated, and did not observe any ill effects.

EIGHTEEN CASES STUDIED BY THE AUTHOR

Notwithstanding the favorable reports from the German clinics, I was somewhat reluctant to make use of the samples of thymophysin kindly sent me by Doctor Graff of the Vienna Clinic, until a patient presented herself in which the preparation was definitely indicated.

The patient was a thirty-year-old primipara, with fairly normal measurements but an oversized infant two weeks overdue. The membranes had ruptured twenty-eight hours before she came under my observation. The pains were weak and irregular. Rectal examination showed an elongated cervix admitting one finger. The vertex was on the brim but was easily displaced. The patient was much exhausted.

She was given hot drinks rich in carbohydrate, glucose and sodium bicarbonate per rectum, and morphine and magnesium sulphate, and allowed to sleep for two hours. I wished to avoid introduction of a bag, as the patient had already had two vaginal examinations and it seemed possible that a cesarean section might be necessary on account of the size of the child.

Thymophysin was given in a small dose (0.5 c.c.) and the patient put in the Walcher position with her legs supported. Within ten minutes the pains became stronger and more regular. In thirty minutes another dose of 0.5 c.c. of thymophysin was given and the uterine contractions became effectively long and regular. The head engaged in two hours and medium forceps were used to terminate the labor. The placenta was expelled spontaneously in twenty minutes.

Another patient upon whom thymophysin produced very satisfactory results had partial placenta previa. She was a para iii, seven and a half months pregnant, and showed a vertex presentation. I induced labor after flushing the vagina with a 2 per cent mercurochrome solution and packing with pledgets of cotton wrung out in a 0.5 per cent solution of lysol. Five hours afterward, the patient began to have slight pains. She was given 1 c.c. of thymophysin intramuscularly. Within fifteen minutes her pains became stronger, occurring at regular intervals. In forty minutes another 1 c.c. of thymophysin was administered. The cervix dilated rapidly, the head engaged, and the woman was delivered one hour and forty minutes following the first injection. There was very little blood lost and, although her blood was typed and a donor prepared, no transfusion was necessary.

One woman, para ii, who had had eclampsia after her first delivery, registered a blood pressure of 120 mm. Hg during her second labor. After 0.5 c.c. of the thymophysin, it rose to 130. One-half hour later, after a second dose, it reached 140. Within a few minutes the child was born and the blood pressure fell promptly to 120.

Similar observations were noted in the cases of two other patients with elevated blood pressure. One had a blood pressure of 140 mm. Hg. After 0.5 c.c. of thymophysin was administered it rose to 142, but came down within five minutes to 134 and in another five minutes to 128. During the rest of the labor the blood pressure did not reach above 128. Fifteen minutes after the expulsion of the placenta, it fell to and remained at 125 systolic and 70 diastolic. The second patient had a blood pressure of 160, which dropped to 140, remaining there during the entire labor.

It would seem that the slight rise in blood pressure in these cases may be due to the action of the pituitary extract in the thymophysin, and the thymus extract most likely plays a part in lowering the high blood pressure. It will be interesting to observe this reaction in a larger number of patients with high blood pressure.

I have observed the use of thymophysin in eighteen cases in all,* and have found that it unquestionably aids dilatation and shortens the first stage of labor. In cases in which labor suddenly ceases with the presenting part in the midpelvis, thymophysin may also be used instead of small doses of pituitary extract. In one such case, one injection resulted in successful delivery in seventeen minutes. The potency of thymophysin seems to persist through the third stage of labor, as in my cases the placenta was usually expelled in fifteen to twenty minutes, and there was no unusual bleeding.

In no case in which I have used thymophysin have I noticed ill effects on either the babies or the mothers. The babies cried as soon as they were born, had good color and progressed well thereafter. The puerperium was entirely uneventful, and the uterus and lochia showed no significant changes.

All of these patients were studied also as to the blood pressure, urine and blood changes. Blood changes, showing the usual leucocytosis, were the same physiologically as I have observed in obstetric cases without thymophysin, a full description of which appeared in my article "Changes in the Leucocytes during Labor and Puerperium" in the January, 1929, issue of *THE AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY*. In normal cases, thymophysin produced a temporary rise in blood pressure of 5 to 20 mm. Hg, followed by a fall. In two cases in which the blood pressure was high when the preparation was administered, there was no such rise and the reading dropped from the beginning.

The bloods of the babies also were studied as to bleeding time, coagulation time, blood platelet count and red and white blood cells. They did not show any deviation from blood obtained from cases in which thymophysin was not employed. A complete study of the blood platelet count will be published in a subsequent article.

As to dosage, I have found it best to give 0.5 c.c. at first, with another dose of 0.5 c.c. in thirty minutes if the first dose proves ineffective; if not, 1 c.c. should be given at the second injection. It seems best to begin with a small dose, as not all uteri react to the drug in the same way. The use of the smaller dose also avoids the initial sudden uterine contraction often observed with the 2 c.c. dose. The preparation is injected intramuscularly.

During the conference which I had with Doctor Temesváry when he was recently in the United States, he informed me that, of late, he has employed thymophysin at the beginning of labor in nearly every normal delivery. He maintains that its use starts the pains more quickly and more regularly, shortening the labor from five to eight or ten hours.

*Since the writing of this paper, ten additional patients were treated with thymophysin with the same gratifying results.

The cases in which I have employed thymophysin are too few to serve as a basis for definite conclusions; but my results appear to support the favorable findings reported by others in larger series of cases and to justify its further trial, especially in cases of uterine inertia in the first stage of labor.

CONCLUSIONS

1. Reports from various European clinics indicate the value of thymophysin (a combination of thymic and pituitary extracts) to increase the force, frequency and duration of feeble labor pains, especially during the first stage but also in the second stage when the pains have stopped.

2. The preparation is administered intramuscularly, preferably in the gluteal region. In my experience, it is best to begin with a smaller dose of 0.5 c.c. followed by a second similar injection or by a dose of 1 c.c., if the first does not prove effective.

3. The use of thymophysin not only hastens and facilitates normal delivery by aiding dilatation of the passages but also lasts into the third stage, so as to promote expulsion of the placenta.

4. The most favorable type of case is primary inertia. When the uterine musculature is exhausted by prolonged labor, the preparation proves ineffective. In such cases, the mother should be given a rest before labor is resumed. Then thymophysin may prove of value.

5. It does not appear to injure the mother or child.

6. Results are sufficiently encouraging to justify other physicians having the facilities to employ the preparation and observe their results. In the meantime, final judgment as to its value should be withheld.

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303 WEST ONE HUNDRED SIXTH STREET.

THE TREATMENT OF PELVIC INFLAMMATORY DISEASE

A REPORT OF 278 CASES TREATED SURGICALLY*

BY JAMES T. PRIESTLEY, M.D., AND FRANKLIN L. PAYNE, M.D.,
PHILADELPHIA, PA.

(From the Gyneccean Hospital Institute of Gynecologic Research)

THE conservative treatment of pelvic inflammatory disease is now the generally accepted method. Operative intervention in the acute stage is practiced by few, and the treatment of the majority of the chronic cases falls outside the domain of surgery. If operation is necessary, the judicious conservation of the pelvic organs should always be the rule.

For years the danger of operative procedures in the presence of acute infection has been recognized. Nevertheless tuboovarian and pelvic abscesses will always require extraperitoneal evacuation and drainage. With this exception, however, palliative treatment is usually followed by a comparatively rapid subsidence of signs and symptoms. After subsidence, palliative measures may often be continued with good results, or should operation be necessary, it can be carried out with a minimum of risk and a maximum of opportunity for conservation of the pelvic organs. Repeated attacks, persistent pain, marked menstrual irregularities, and adnexal masses which show no tendency to resolution, are indications for operation. Economic or sociologic conditions of the patient may likewise render surgery the treatment of choice.

A review of the records of 98 patients recently treated, suffering from acute pelvic inflammatory disease, shows that 66 were discharged from the hospital without operation. Only one returned for subsequent surgical treatment. Ten of the remaining 32 required evacuation and drainage of tuboovarian or pelvic abscesses, while 22 were operated upon during the subacute or chronic stage. This gives an actual operative incidence of 25 per cent. This high percentage is explained by the fact that the majority of these patients were in poor financial circumstances, and had suffered from repeated exacerbations of the infection.

Repeated attacks of neisserian inflammatory disease are generally believed to be due to reinfection, either from without, or by extension upward from latent foci in the lower genital tract. Therefore, before the patient is discharged from the hospital, efforts are made to eradicate these latent foci from the cervix, Skene's tubules and labial glands, and careful instructions are given as to the dangers of reinfection.

*Read at a meeting of the Philadelphia Obstetrical Society, May 2, 1929.

These people are kept under careful observation, a point which we cannot emphasize too strongly. The patient is rare who will follow the instructions of her physician, unless she is frequently checked up and reinstructed. Subsequent treatment such as the injection of foreign proteins, local applications, diathermy, and general hygienic measures, are often indicated.

In the operative treatment of pelvic inflammatory disease, conservatism is again the rule. We believe in retaining pelvic organs wherever it is possible, provided they are not diseased or mutilated. A single large retention cyst may be safely excised from an otherwise normal ovary. As a rule, however, the ovary should be removed in its entirety or allowed to remain undisturbed. The freeing of adhesions which bind down a normal and symptomless ovary often results in impaired circulation or mutilation which renders its excision imperative.

A careful follow-up study was made of 278 patients who received surgical treatment for pelvic inflammatory disease in the Gynecological Service of the University Hospital. The patients were followed up for periods varying from six months to ten years. A large percentage of

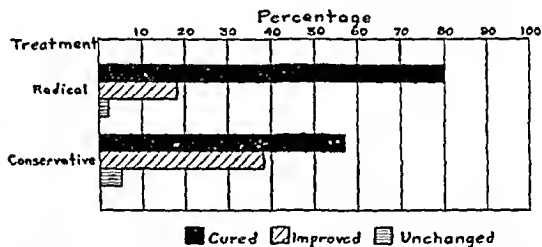


Fig. 1.—Comparing in percentage the relief of pain resulting from the radical and the conservative operations. Note the high percentage of absolute cures after radical surgery. Note also, the percentage of patients who were almost, but not entirely, relieved of pain following conservative measures. This gives a failure to relieve pain of (5 per cent) from the conservative and (2 per cent) from the radical operation.

them were examined by members of the staff at frequent intervals. Information concerning the remaining few was obtained by means of detailed questionnaires.

Since patients with pelvic infection seek treatment chiefly because of pain, the relief of this symptom will be discussed first. One hundred and sixty-two patients reported the presence or absence of pain following operation. Six (4 per cent) stated that they were not relieved, 50 (31 per cent) reported marked improvement, and the remaining 106 (65 per cent) were entirely relieved. Therefore 156 (96 per cent) of the 162 were largely or entirely relieved by operation. These patients may be divided into two classes; first, the group which was treated with conservative measures, 56 in number, including those in whom 1 or both ovaries, and at times the uterus, remained intact; second, the group treated by radical procedures, 106 in number, in whom the uterus and both tubes and ovaries were removed. The two groups are compared in Fig. 1. We see that the radical operation gave a

higher percentage (80 per cent) of complete relief from pain than did the conservative (57 per cent). We also see that in the group treated conservatively a higher percentage (38 per cent) of patients were much improved than in the other (18 per cent) group. Thus, so far as pain is concerned, we have cure or marked improvement in 98 per cent following radical, and 95 per cent following conservative surgical measures.

In the group treated conservatively the details of the postoperative findings were determined in 39 of the 45 patients who complained of pain. Such findings as tender ovaries of normal size, culdesac induration with tenderness, and five retention cysts were observed in 15 of these patients. Nothing was found to account for the pain in the remaining 24. The cause of this residual pain in pelvis which are

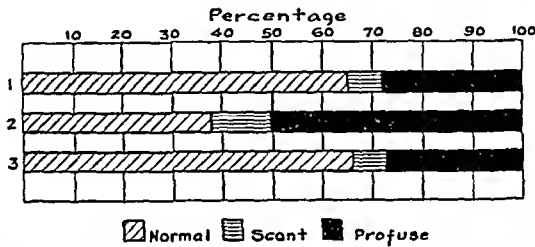


Fig. 2.—Showing in percentage the effect of bilateral salpingectomy upon the quantity of menstrual flow. No. 1, Prior to pelvic inflammation. No. 2, During pelvic inflammation. No. 3, After bilateral salpingectomy. Note the similarity between No. 1 and No. 3 in contrast to No. 2.

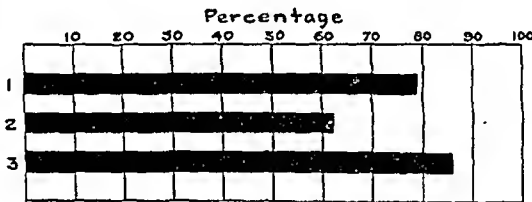


Fig. 3.—Showing the effect of bilateral salpingectomy upon the regularity of the menstrual periods. No. 1, Prior to pelvic inflammation. No. 2, During pelvic inflammation. No. 3, After bilateral salpingectomy. Note the high percentage of regular periods in No. 3 in contrast to No. 2.

normal to palpation is not clear. It is probably due to perioophoritis which impairs the function or the circulation of the affected ovary. Under such circumstances diathermy may be efficacious.

The value of maintenance of the menstrual cycle in the absence of procreative ability is often questioned. We are of the opinion that it is of importance for two reasons. First, from the standpoint of psychology it is of value. Second, because there is clinical evidence, as will be shown later, of an interrelation between the uterus and the ovary which makes the conservation of both desirable when possible.

The character of the menstruation of a number of patients following conservative surgery has been studied. It closely resembles that seen prior to the onset of disease, both as to regularity and quantity of flow. Scanty, infrequent menstruation is rare following judicious conserva-

tive measures. In Fig. 2 are seen the effects of bilateral salpingectomy upon 29 patients. The control bar No. 1 shows the type of periods, described by the patients as normal, which preceded the development of the disease. Bar No. 2 shows the type of flow in the presence of inflammatory disease. And in bar No. 3 we see the return to normal menstruation following bilateral salpingectomy. The regularity of the menstrual periods is also restored by this procedure, as is seen in Fig. 3. With the same group of patients, the periods returned to normal, regularity in 86 per cent in contrast to 62 per cent which were regular prior to operation. Thus, it appears that the menstrual function is usually restored to normal following bilateral salpingectomy with conservation of the ovaries.

In studying the development of the menopause following the surgical treatment of inflammatory disease, we use 3 symptoms as criteria: (1) flushes of heat, (2) development of nervousness, (3) and recently acquired dizzy spells. Definite statements concerning these symptoms were obtained from 153 patients all of whom were too young to exhibit

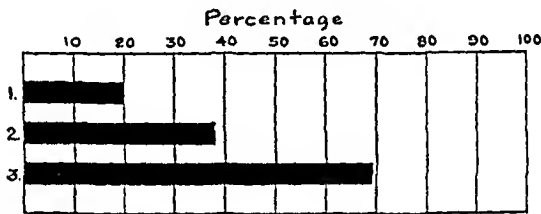


Fig. 4.—Showing the incidence in percentage of menopausal symptoms following: (1) conservation of the uterus and one or both ovaries, (2) ovarian conservation with supravaginal hysterectomy, and (3) total removal of the internal pelvic organs. Note that as the surgery becomes more radical the incidence of menopausal symptoms increases.

the natural menopause. Fifty-five had been treated radically and 98 conservatively. The results of this study are seen in Fig. 4. In the group treated by hysterectomy and bilateral salpingo-oophorectomy, 69 per cent developed menopausal symptoms, while in the group treated conservatively only 25 per cent suffered from similar symptoms, which were of milder degree. Further analysis shows that when the uterus was conserved with one or both ovaries, symptoms of the menopause were less likely to develop than if the ovary alone was preserved. That is to say, only 20 per cent of the 69 patients in whom the uterus and one or both ovaries were saved, developed menopausal symptoms, while 38 per cent of the 29 having an ovary, without the uterus, were similarly affected. Furthermore, in the group with the uterus and ovarian tissue intact, the menopausal symptoms were far less severe than in the group with only an ovary remaining. The preservation of the uterus in conservative surgery definitely reduces both the frequency of development and the severity of the menopausal symptoms.

Menopausal manifestations often appeared much earlier following the radical than the conservative operation. The majority of the radical group, having neither ovaries nor uterus left, developed symptoms within two months. This was not the case when ovarian tissue was conserved. These patients often proceeded normally for nine to twelve months, and then developed mild menopausal manifestations, not unlike those experienced in the normal menopause.

The duration and the severity of these symptoms also varied with the type of operation. After the removal of the uterus and both ovaries, the symptoms were usually short lived, and of greater severity. In case ovarian tissue was conserved, the patient suffered much less severely, but over a longer period of time. Several patients treated conservatively complained of moderate menopausal symptoms of more than six years' duration.

The nervous temperament of the patient appears to be a more important factor than age in governing the severity of the menopause. In studying the character of the menopause following bilateral oophorectomy, it was found that as a general rule, the younger the patient the more severe were the symptoms. But it was also found that the most distressing manifestations appeared in those patients, regardless of age, who displayed evidences of nervous instability prior to operation.

Retention cysts were occasionally observed following conservative operations for pelvic inflammatory disease. Ninety-four patients in whom one or both ovaries had been conserved were repeatedly examined. Both ovaries were intact in 29 and one in each of the remaining 65. Postoperative enlargement of an ovary occurred in 14 (14.8 per cent) of the 94 patients examined.

The studies showed that neither ovary was more likely to become cystic than the other. Sixty-five patients had one ovary conserved, the right in 40 and the left in 25. Of this number, 6 (15 per cent) on the right and 4 (16 per cent) on the left, showed evidences of cystic changes.

Retention cysts most commonly appear in the first three months, but they may develop as late as twenty months after operation, and they may undergo complete subsidence under palliative treatment.

These cysts often give rise to no symptoms. Of the 14 patients who developed cysts, 9 have been free of pain from the time of operation to date. Only 5 complained of pain which could be ascribed to the presence of the cyst. Three of these subsided under palliative treatment in from five to thirty months. In 2, pain required the removal of the affected ovary. This gives an incidence of 2 in 94 (2.1 per cent) who required reoperation, because of painful retention cysts.

Abnormal menstruation is at times associated with cystic enlargement of the ovary. This does not commonly occur, for in only 3 of the 14 patients was it a complaint. In 2, the periods were too frequent,

and in one they were scanty. In none of these was reoperation necessary. From these facts it is evident that retention cysts usually give rise to no symptoms and that they may spontaneously disappear. On the other hand, they occasionally result in pain or menorrhagia requiring operation or irradiation.

As a part of this study, follow-up records were obtained upon 54 patients who complained of backache prior to operation. The backache was relieved by operation in 28 (52 per cent) while 26 (48 per cent) were not relieved. It is concluded from these figures that slightly more than 50 per cent of the backaches of such patients are attributable to tuboovarian disease.

SUMMARY

The following observations were made upon 278 patients, treated surgically.

1. Pain was greatly lessened or entirely relieved in 96 per cent of the patients examined.

2. Menopausal symptoms developed in 69 per cent following radical and 25 per cent following conservative operations. These symptoms, if present after conservative surgery, were slow in developing and were not severe. This was particularly true when the uterus also remained intact.

3. The normal menstrual function was commonly reestablished following bilateral salpingectomy.

4. Secondary operation for cystic degeneration of a conserved ovary was necessary in 2.1 per cent of the cases.

CONCLUSIONS

1. The treatment of pelvic inflammatory disease should be conservative in delaying, and when possible, in avoiding, surgical intervention.

2. In the chronic cases indications for operation are: repeated attacks, persistent adnexal masses with pain and tenderness, marked menstrual disturbances, and certain economic conditions.

3. In the surgical treatment conservation of one or both ovaries and if possible the uterus, is the procedure of choice.

(For discussion, see page 129.)

THE VALUE OF MERCUROCHROME AS AN ANTISEPTIC IN OBSTETRICS

A STATISTICAL REVIEW OF 300 CONSECUTIVE HOSPITAL DELIVERIES
(From the Department of Obstetrics and Gynecology, University of Michigan)

BY L. GRANT BALDWIN, M.D., ANN ARBOR, MICH.
(Instructor of Obstetrics and Gynecology, University of Michigan)

THIS review was made with the primary object of ascertaining the value of mercurochrome as an obstetric antiseptic as judged by the resulting morbidity. However, it was increased so as to include a more or less complete summary of the cases studied. Special attention has been given to the relation of morbidity to various factors, such as multiparity, operative procedures, and trauma to the birth canal. In each case an attempt has been made to find the cause of the morbidity; but, in spite of this, 10.8 per cent of the morbid cases remain unexplained.

Any summary of morbidity is apt to be confusing, inasmuch as there are so many standards in use. For that reason three standards have been used in this work: namely, the University of Michigan standard, U.M. in the tables; the standard of the American College of Surgeons, A.C.S. in the tables; and finally, the standard proposed by Goodall and Wiseman,¹ G. in the tables.

The University of Michigan standard considers as morbid all cases showing a temperature of 100.4° at any time from delivery to discharge, temperatures being taken every four hours. The American College of Surgeons standard considers as morbid all cases that show a temperature of 100.4° on two successive days, exclusive of the first twenty-four hours after delivery. Goodall and Wiseman prefer to consider as morbid all cases in which the temperature exceeds 99° on any three consecutive days, exclusive of the first twenty-four hours; and, in addition, all cases that are morbid but afebrile, such as subinvolutions and thrombophlebitis. It is, of course, apparent that the American College of Surgeons standard is the most lenient, while that of Goodall and Wiseman is the most severe.

Of the 300 cases reviewed, 260 or 86.6 per cent were normal, and with but few exceptions were delivered by senior medical students. There were 222 primiparae and 78 multiparae. The average age was twenty years eight months; the youngest patient was twelve while the oldest was forty-three.

Forty cases were abnormal, a percentage of 13.3 per cent. These were made up as follows: 15 low forceps; 6 cesarean sections; 6 midforceps; 6 extractions; 4 versions and extractions; 1 manual rotation and flexion of a face presentation; 1 high forceps, and 1 craniotomy.

There were 18 abnormal presentations: 13 breeches, 3 persistent occiput posterior presentations, and 2 face presentations. Twenty-one cases had operative

TABLE I. MORBIDITY: TOTAL AND OBSTETRIC AND IN RELATION TO MERCUROCHROME

	TOTAL				OBSTETRIC					
	U.M.	PER CENT	A.C.S.	PER CENT	U.M.	PER CENT	A.C.S.	PER CENT	G.	PER CENT
Total	300				111	36.6	53	17.6	163	54.3
Without mercurochrome	80				32	40.0	16	20.0	50	62.5
With external application of mer- eurochrome	159				56	35.2	28	17.6	82	53.2
External and internal mercurochrome application	61				23	37.7	9	14.7	31	50.8

procedures other than an operative delivery: namely, 14 surgical inductions all with a large hard rubber bougie, and 7 manual removals of adherent placentas. There were 5 sets of twins, 6 eclamptics, 7 preeclamptics, 5 nephritic toxemias, 1 placenta previa, 1 hydramnios, and 8 postpartum hemorrhages. Extraneous complications consisted of 3 cases of pneumonia, 2 cases of severe cardiac disease, 1 case of diabetes, 1 case of active pulmonary tuberculosis, and 1 case each of carcinoma of the jaw, erysipelas, and essential hypertension.

For the first group of 80 cases, the routine preparation consisted of an enema at the onset of labor, repeated in twenty-four hours if the patient was still in labor. The pubic region was shaved on admission to the waiting room, and scrubbed with sterile green soap, $\frac{1}{2}$ per cent lysol, and sterile water just before delivery. For the next group of 69 cases, in addition to the above, the vulva, thighs, and lower abdomen were sprayed with a 4 per cent alcoholic aqueous acetone solution of mercurochrome at the onset of labor, and again at the time of delivery. For the last group of 61 cases, in addition to the above, one ounce of a 2 per cent aqueous solution of mercurochrome was instilled in the vagina, and repeated every six hours until delivery.

Table I shows the total and the true obstetric morbidity by groups. In compiling the true obstetric morbidity, cases have not been included that have had a definite cause for fever other than obstetric, such as acute upper respiratory infections. If, however, an obstetric condition was present in addition to the extraneous cause for temperature, the morbidity was attributed to it. On looking over similar reviews, one is astonished to discover that obstetric morbidities often do not include conditions such as acute mastitis and cracked nipples. This separation from the obstetric group of such cases, together with others somewhat less striking, seems hardly logical. Thus, in this review all conditions that could possibly be considered of obstetric origin were included.

TABLE II. CONDITION AT TIME OF DISCHARGE OF 282 PATIENTS EXAMINED

	NUMBER	PER CENT
Perineum not completely healed	18	6.3
Perineum not repaired	1	3.5
Perineum relaxed	33	11.7
Cervical tears	197	69.8
No palpable cervical tear	85	30.2
Repair broken down	3	1.0
Perineum infected	2	0.7
Subinvolution	43	15.2
Retroversion, 1° to 3°	32	11.3
Adnexitis	5	1.7
Deaths	6	2.1
Not examined	18	6.3

Table I shows the unexpected, for from it can be learned that mercurochrome used in the above manner, did not decrease the morbidity materially. It was Mayes'^{2, 3, 4} work that originally aroused our interest in mercurochrome; but our results do not parallel his, although he has markedly reduced the morbidity in his cases by this means.

As stated before, the comparison of morbidity figures is unsatisfactory, because of the wide range of standards. However, the following gives some idea of the variation: Toland,⁵ using a standard of 100° twice in any twenty-four hours exclusive of the first twenty-four, reports a total morbidity of 25.6 per cent, and 34 per cent for operative deliveries as against 25 per cent for the nonoperative group. Tracy and First,⁶ using a standard of 100.4° twice in one day exclusive of the first twenty-four hours, report a total morbidity of 4 per cent, 5 per cent for private patients and 2.9 per cent for ward patients. Goodall and Wiseman,¹ using the standard previously described, report a total morbidity between 30 and 40 per cent, roughly 50 per cent for multiparae and 30 per cent for primiparae. The annual report for the year 1924-25 of the Rotunda Lying-In Hospital gives a morbidity rate of 5.4 per cent, but does not mention the standard used. Stone and Sisson⁸ state that 21.9 per cent of all cases were febrile, if the first day fever be eliminated.

Of the 300 patients delivered, 282 were examined prior to discharge, the results of which are shown in Table II. Naturally the most common lesion found was the palpable cervical tear occurring in 69.8 per cent of the cases examined. Next in order of frequency were subinvolutions and retroversions. An attempt has been made to ascertain how the pathologic lesions found at discharge compare with the mor-

TABLE III. RELATION OF OBSTETRIC MORBIDITY TO PELVIC PATHOLOGY AND TO VARIOUS OBSTETRIC PROCEDURES

	CASES	U.M.	%	A.C.S.	%	G.	%
Perineum not completely healed	18	8	44.4	3	16.7	9	50.0
Perineum not repaired	1	1	100.0	1	100.0	1	100.0
Perineal repair broken down	3	1	33.0	1	33.0	1	33.0
Infected perineum	2	1	50.0	0	0	1	50.0
Cervical tears	197	71	36.0	39	19.7	110	55.8
No palpable cervical tears	85	36	42.3	10	11.7	42	49.4
Subinvolutions	43	23	53.4	14	32.5	43	100.0
Retroversions, 1° to 3°	32	17	53.1	7	21.9	19	59.4
Adnexitis	5	3	60.0	2	40.0	3	60.0

TABLE IV

	CASES	U.M.	%	A.C.S.	%	G.	%
Normal deliveries	260	93	35.7	42	15.7	128	49.2
Abnormal deliveries	40	18	45.0	11	27.5	25	62.5
Low forceps	15	10	66.6	5	33.3	14	93.3
Midforceps	6	1	16.7	1	16.7	2	33.0
High forceps	1	1	100.0	1	100.0	1	100.0
Version and extractions	4	1	25.0	1	25.0	1	25.0
Extractions	6	0	0	0	0	0	0
Manual removal of placenta	7	1	14.3	0	0	2	28.6
Manual rotation and flexion	1	0	0	0	0	0	0
Cesarean sections	6	4	66.6	3	50.0	4	66.6
Craniotomies	1	0	0	0	0	0	0
Surgical inductions	14	4	28.5	1	7.1	7	50.0
Postpartum hemorrhage	8	3	37.5	0	0	3	37.5

bidity. This information is contained in Table III. Of special interest is the fact that the University of Michigan morbidity figures are higher for patients without cervical tears than for those with this condition;

and, although the reverse is true for the other standards, the difference is not as great as one would expect.

Table IV shows the relation of morbidity to abnormal deliveries, and also the percentage morbidity for each type of operative delivery. Forceps and cesarean sections produced the highest morbidity, while the remaining operative procedures did not increase the morbidity above the average.

Table V contrasts the morbidity of primiparae and multiparae, and also episiotomies, tears, and unlacerated perineums. The primiparae had a higher morbidity than the multiparae by all classifications, which is the opposite of what Goodall and Wiseman found. The unlacerated perineums had the lowest morbidity by all classifications. The episiotomies and tears were nearly the same for the University of Michigan standard, but varied considerably for the other two, the episiotomies being much less in each case.

TABLE V. RELATION OF OBSTETRIC MORBIDITY TO MULTIPARITY AND TO PERINEAL DAMAGE

	CASES	U.M.	%	A.C.S.	%	..	o
Primiparae	222	92	41.4	45	21.2	126	56.7
Multiparae	78	19	24.3	8	10.3	37	48.7
Episiotomies	59	26	44.6	10	17.9	28	47.2
Tears	136	57	41.9	31	23.3	92	67.6
No tears	105	28	26.6	12	11.4	43	40.9

TABLE VI. PERINEAL LACERATIONS

	TOTAL 300		PRIMIPARAE 222		MULTIPARAE 77	
	NO.	%	NO.	%	NO.	%
Episiotomies	59	19.6	56	25.2	3	3.8
1 degree	79	26.3	57	25.6	22	28.2
2 degree	55	18.3	53	23.8	2	2.5
3 degree	2	0.6	2	0.9	0	0
None	105	35.0	54	24.3	51	65.3

Routine episiotomies were not done, and Table VI shows the resulting perineal damage. It is interesting to note that practically one quarter of the primiparae were delivered without lacerations; especially so, when it is remembered that the deliveries were conducted by students, the majority of whom were delivering their first case.

Table VII shows the etiology of each morbid case, both obstetric and total; and, as one would expect, the uterus is the offending organ in the majority of cases. There were 6 deaths in 300 cases, or a maternal mortality of 2 per cent, Table VIII showing the cause for each of these. The 2 patients who died from pneumonia were both seven months pregnant, *delivering spontaneously*; and neither the delivery nor the pregnancy can logically be considered as a cause of death. Whether the death from erysipelas should be considered as obstetric is questionable. This patient had a threatened toxemia and delivered at seven months,

having a breech delivery. She developed erysipelas within fifteen hours, and died twenty-six hours later. The death from peritonitis following cesarean section occurred in a patient who had been in labor for two days prior to admission, and had had one previous cesarean operation. She had been cared for by a midwife; and the pathologist reported active placentitis, which must have been present prior to admission. The remaining 2 deaths were truly obstetric, and all responsibility for these must be assumed by the obstetric staff.

TABLE VII. OBSTETRIC MORBIDITY

	U.M.	%	A.C.S.	%	G.	%
Total obstetric	111		53		163	
Uterus	64	57.6	33	62.2	80	49.0
Breasts	15	13.5	4	7.4	12	7.3
Unexplained	12	10.8	5	9.4	35	20.8
Pyelitis	2	1.8	1	1.8	3	1.8
Hemorrhage	4	3.6	2	3.7	4	2.3
Subinvolution without fever	0	0	0	0	13	7.9
Infected perineum	4	3.6	1	1.8	4	2.3
Thrombophlebitis	2	1.8	0	0	3	1.8
Pulmonary embolism	1	0.9	2	3.7	2	1.2
Erysipelas	1	0.9	1	1.8	1	0.6
Peritonitis	1	0.9	1	1.8	1	0.6
Eclampsia	1	0.9	1	1.8	1	0.6
Acute gonorrhoea	2	1.8	0	0	1	0.6
Adnexitis	1	0.9	1	1.8	2	1.2
Ischiorectal abscess	1	0.9	1	1.8	1	0.6

NONOBSTETRIC MORBIDITY

	U.M.	%	A.C.S.	%	G.	%
Total	17		14		14	
Upper respiratory infection	9	52.9	8	57.1	7	50.0
Pneumonia	3	17.6	3	21.4	3	21.4
Otitis media	3	17.6	2	14.3	2	14.3
Advanced tuberculosis	1	5.8	0	0	1	9.2
Vaccination	1	5.8	1	9.2	1	9.2

TABLE VIII. CAUSES OF DEATHS

Pneumonia at seventh month with labor	2
Albuminuria and erysipelas	1
Eclampsia and diabetes	1
Peritonitis, after cesarean section	1
Postpartum hemorrhage	1

Of the 305 infants born there were 26 deaths, a total infant mortality of 8.5 per cent. We have classified these according to Kamperman's⁹ outline, into three groups: The first is made up of deaths occurring prior to viability; that is, less than seven months, and weighing less than 1500 grams. The second group is made up of prematures that have a chance of life, and the third is made up of full-term births. On this basis 7, or 2.9 per cent, were in Group I; 3, or 0.98 per cent, were in Group II, and 16, or 5.24 per cent, were in Group III. Kamperman's figures for 2478 births were 2.54 per cent, 0.88 per cent, and 3.4

per cent respectively for each of the three groups. Tracy and First,⁶ in a review of 1001 obstetric cases, give an infant mortality rate of 18 per cent.

Toxemias were the cause of 4 deaths in Group I; the cause for the other 3 could not be determined. In the second, or borderline group, 1 death was due to a congenital enlargement of the thyroid, 1 to pneumonia, and 1 to unknown cause. Group III comprised 16 cases; 12 of these were stillbirths, and 4 were neonatal deaths. The stillbirths were classified as follows: 6 from asphyxia, 3 having had tight coils of cord about the neck; 1 followed version, and 2 were unexplained; 1 craniotomy for hydrocephalus, 1 subluxation of a cervical vertebra following breech delivery, 1 monstrosity, 2 intracranial hemorrhages, 1 following delivery by forceps, and 1 from maternal eclampsia. The 4 neonatal deaths were diagnosed as follows: 2 congenital hearts, 1 poliomyelitis, and 1 unexplained except for pneumonia of mother.

There were 13 breech deliveries of viable age; of these there was 1, 7.6 per cent, fetal death, the result of a subluxation of a cervical vertebra. This figure corresponds favorably with those of King and Gladden¹⁰ who have reviewed the literature on this subject, and have found that statistics varied from 3.5 per cent for the Clinic Baudeloque, to 40 per cent for Hagar's figure in rural practice.

Of the 6 eclamptic patients there was 1 maternal, and 2 infant deaths, a mortality of 16.6 per cent and 33.3 per cent respectively. The patients in this series were all treated by morphine, and immediate surgical induction by bougie if labor was not in progress. In addition, elimination was hastened by giving magnesium sulphate by stomach tube, and by high colonic irrigations. Operative deliveries were not resorted to until the second stage. Three patients were delivered by low forceps, 1 by midforceps, and the remaining two were allowed to deliver spontaneously. The number of cases in this study are, of course, too small to be indicative of the value of any form of therapy. It might be explained, however, that the one death resulted in a patient who had a severe case of diabetes, and who had been advised to have the pregnancy terminated when three months pregnant.

These figures are higher than those given by Clason,¹¹ who gives a maternal mortality of 10.8 per cent for expectant treatment, and 7.6 per cent for the Stroganoff Zweifel routine. His fetal mortality was 24.4 per cent. Falls¹² gives an infant mortality of 27 per cent for viable babies. Stander¹³ has summarized the maternal mortality from eclampsia in twelve large clinics using different treatments, and has found that the figures vary from 8.4 per cent (Stoeckel) to 47.8 per cent (Miller and King). Both extremes are the results of radical methods. Miller and Martinez¹⁴ report a maternal mortality of but 6.9 per cent, using a liver extract, heparmone.

There were 5 patients with nephritic toxemia, in all of whom labor was induced surgically. There were no maternal deaths; but there were 2 fetal deaths, both babies being nonviable. Following delivery,

all of these patients were advised to be sterilized, as the danger of future pregnancies was considered ample indication.

Surgical inductions were all performed by means of large hard rubber bougies, having diameters of from three-quarters of an inch to one inch. Fourteen such procedures were undertaken, 5 for nephritic toxemia, 4 for eclampsia, and 5 for preeclampsia. In all cases labor was induced successfully, and there was no increase in morbidity over the average for nonoperative deliveries.

All 6 of the patients delivered by cesarean section had contracted pelves. In addition, 1 had a threatened toxemia, 1 a mitral stenosis, and 1 had previously been operated upon for construction of an artificial anus. Three were pregnant for the first time, and were not sterilized. Two had had one previous cesarean operation and were sterilized, as was the one who had had two previous cesarean sections. One death in 6 cases gives an extremely high mortality. Since August, 1925, the clinic's cesarean mortality totals 6.6 per cent.

The number of cases of manual removal of the placenta is unusually large, and there is no apparent explanation. No placenta was removed merely because of elapsed time since delivery. In each case this procedure was resorted to because of severe hemorrhage, and only after Credé expression had failed. Likewise, Credé expression was not attempted unless there was more than average bleeding, the fundus being left entirely alone as long as there were no signs of hemorrhage. There was no mortality and no increase in morbidity as a result of removal of these placentas. However, Jarcho¹⁵ quotes Bumm as giving this procedure a mortality of 10 per cent.

Version was resorted to in 4 cases; 1 each for placenta previa, transverse presentation, hydramnios, and twins. The hydramnios was associated with a monstrosity, and the transverse presentation with a nonviable child; this gives an infant mortality of 50 per cent for this procedure and a maternal morbidity which is not higher than average, except from the American College of Surgeons' standard.

CONCLUSIONS

1. The maternal morbidity of 36.6 per cent, 17.6 per cent, and 54.3 per cent for the three standards in the 300 cases reviewed is somewhat higher than that reported by other clinics.

2. Mereurochrome has not reduced maternal morbidity to any marked degree.

3. Operative procedures other than cesarean section and forceps deliveries have not increased the morbidity.

4. Primiparae have a higher percentage of morbidity than multiparae.

5. The unlacerated perineum is associated with a lower morbidity than episiotomies or lacerated perineums.

6. The uterus is the offending organ for the majority of morbid cases.

7. Morphine plus surgical induction is a satisfactory means of treating eclampsia.

8. While the maternal mortality is high for this series, at least three of the deaths were not truly obstetric.

9. The treatment of nephritic toxemias by early induction has given satisfactory results.

10. Surgical induction, by means of a large hard rubber bougie, is a comparatively sure and safe means of bringing on labor.

11. Manual removal of an adherent placenta need not result in a high morbidity.

12. Version on the viable normal fetus did not increase fetal mortality and had practically no effect on maternal morbidity.

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Experiments by the authors lead them to conclude that the decrease in pressure from the umbilical artery to the umbilical vein is approximately 50 per cent. The blood pressure in the umbilical vein is higher than that in other veins in the body circulation, and the circulation in this vessel is maintained by the fetal heart and its own mechanism. The wall of the umbilical artery is impervious to colloid as well as to simple solutions. The wall of the umbilical vein is impervious to colloids but permits the passage of true solutions in both directions.

RALPH A. REIS.

MASSIVE OVARIAN HEMORRHAGE*

BY FRANK B. BLOCK, M.D., PHILADELPHIA, PA.

(From the Surgical Department of the Jewish Hospital, Philadelphia)

MASSIVE intraperitoneal hemorrhage from a rupture of an ovarian follicle is not unusual. It might be of interest, however, to consider the subject from several angles, with particular reference to the material that has been presented since Phaneuf's¹ collective review in 1924. He found that the literature previous to 1900 did not clearly establish whether or not the hemorrhage was due to ectopic gestation, therefore he confined his observations to the literature after that date. He was able to find reports of 20 cases of ruptured follicular cyst, 22 cases of ruptured corpus luteum cyst and 17 cases of hematic cyst, type not stated. To these he added three cases of his own. Since then there have been several cases reported, the reports having little in common except that no case was diagnosed before operation.

Report of Case.—A married woman, twenty-five years old, was admitted to the Jewish Hospital on October 22, 1928 complaining of severe abdominal pain. She stated that six hours before admission she experienced a sharp pain in the lower abdomen, chiefly in the right lower quadrant, which was followed by nausea but no vomiting. The pain persisted and later was accompanied by a sensation of chilliness but she had had no distinct chill. Her pulse was 90, temperature 99 and respirations 24. Her past history revealed that seven years ago she had an attack of "acute appendicitis" and recovered without surgical intervention. Since then her general health has been good. Her menses have always been irregular, coming at three to six week intervals and lasting from seven to ten days. The last menstrual period was three weeks ago and was perfectly normal. She had had no intermenstrual bleeding nor discharge. She had one child and no miscarriages. On examination it was noted that her color was good but her expression was apprehensive. Her skin was warm and moist. Abdominal examination revealed some tenderness in the lower abdomen, especially in the midline and above Poupart's ligament on the right side. There was slight rigidity of the lower part of the right rectus muscle. Bimanual vaginal examination revealed a sensation of tenseness in the right adnexa but no distinct masses were palpable. Her hemoglobin was 78 per cent, red blood cells 4,600,000, leucocytes 20,000 with 86 per cent of polynuclear cells. The blood pressure was 120/70. The urine was negative. She was kept under observation with tentative diagnoses of acute appendicitis or ectopic gestation. Seven hours later her temperature was 99.4°, her pulse had increased to 120 and her respirations to 32, and operation was decided upon as an immediate procedure. Feeling more inclined toward the diagnosis of acute appendicitis than tubal pregnancy, I made a McBurney incision which is my usual custom in all acute appendicitis cases. On opening the peritoneal cavity considerable blood gushed from the wound. Without great difficulty the right tube was brought up into the wound and found to be normal. On examining the right ovary however, a punched-out rupture about 3 mm. in diameter was found over the remains of a follicle. This rupture had perforated a small vein

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and active hemorrhage was still going on. The bleeding was controlled by two mattress sutures of fine catgut which were placed under the site of rupture. The appendix was found to be posterior but not inflamed and was removed. The wound was closed without drainage. The convalescence was entirely normal and she was discharged as cured on November 1, ten days after admission.

ETIOLOGY

For an intelligent interpretation of the literature on this subject it is necessary to properly classify the cases according to their etiology. The classification of Stein, quoted by Feiner,² seems adequate for this purpose. He states that the hemorrhage may be due to the following causes:

Local

1. Menstrual (excessive menstrual hyperemia)
2. Nonmenstrual
 - a. Active hyperemia, as acute or chronic oophoritis
 - b. Passive hyperemia, as thrombus, torsion, varix
 - c. Primary or secondary neoplasm
 - d. Trauma, excessive coitus, etc.

General

1. Diseases altering the composition of the blood
 - a. General disorders of nutrition as anemia or chlorosis
 - b. Hemophilia
 - c. Infectious disorders, as typhoid, acute exanthemas, etc.
2. Phosphorus poisoning
3. Venous congestion of the abdominal viscera, as in heart or lung disease

While the foregoing classification seems thoroughly comprehensive, there is quite a difference of opinion among other reporters as to the most important etiologic factor. Traugott³ admits the possibility of grave hemorrhage from the ovary only in leucemia, phosphorus poisoning, extensive burns, hemorrhagic diathesis, hypertension, neoplasms and acute torsion. All the other reported instances he regards as overlooked extrauterine (usually tubal) pregnancy. Such was his case with apparent bleeding from a large ruptured cyst in the ovary in a young married woman. The ovum was found in the abdomen but the tube was macroscopically normal. However, sections of the specimen revealed syncytial cells resembling chorion. Toldy⁴ calls attention to the statement of earlier writers that ovarian hemorrhage frequently occurs at the time of menstruation or a little before, as in the case here reported. He is of the opinion that this is not due to hyperemia but to increased permeability of the capillaries during menstruation. Wilson⁵ reporting 7 cases, states that the process underlying this form of hemorrhage seems to be an exaggeration of the normal physiologic mechanism of rupture of the graafian follicle. Roth⁶ thinks that changes in the intraperitoneal pressure play a part in the production of these hemorrhages, particularly the negative pressure which is frequent in the peritoneal cavity. Positive pressure keeps the tube applied to the ovary, but if there is negative pressure in the pelvis this application will be incomplete and the aspiration exercised by the peritoneal cavity may cause hemorrhage. Simon⁷ in a study of 30 cases found the onset of the hemorrhage to occur invariably in the interval between ovulation and menstruation, i.e., during the emptying of the follicle but if such be the case it is difficult to explain the case reported by Dolynskyj and Benzion⁸. They report a patient who had 200 c.c. of blood in the

peritoneal cavity as the result of a ruptured follicle which occurred when she was between three and four months pregnant. The patient aborted and recovered. Inasmuch as ovulation and menstrual congestion probably do not occur during pregnancy, it is reasonable to suppose that in their case the hemorrhage was from a corpus luteum. Klein⁹ reports a massive hemorrhage from a ruptured corpus luteum cyst probably occurring during coitus. He was able to demonstrate a rupture in a vein in the wall of the cyst. Hemorrhage from twisted cysts of the type reported by Chambers¹⁰ and from endometriomas as reported by Beall¹¹ are quite common and seldom of massive proportions and need not be considered here.

SYMPTOMATOLOGY

In the large majority of the cases reported, the history is almost uniform. The patient is in the menstruating age, and while in apparent health, she suddenly develops lower abdominal pain of varying degrees. The onset is apt to be in the premenstrual period and as a rule is not severe enough to give the appearance of shock but if the bleeding continues, the signs of internal hemorrhage will appear later. The pain is probably due to the irritation of the free blood in the pelvis. We should expect that the pain would be referred to the left side as is quite common in pelvic irritations but curiously enough it is usually referred to the right side and many cases have been diagnosed as acute appendicitis on this account. This reference of pain to the right side has been noted by Hadden,¹² Gross¹³ and Lurje¹⁴ in cases in which the ruptured follicle was in the *left* ovary, so that the pain is probably not due to the traumatism of the ovary as the result of follicular rupture. The pain usually continues and is associated with tenderness in the lower abdomen and some rigidity due to the peritoneal irritation and if the hemorrhage continues, the condition of the patient points to the necessity of surgical intervention.

DIAGNOSIS

No cases have been found in the literature in which the diagnosis was made before operation. Korach¹⁵ states that it is frequently impossible to differentiate between appendicitis and a follicular rupture and advises operation in cases of doubt. Toldy⁴ says that the differential diagnosis from ectopic pregnancy is impossible and only when the patient is a virgin can ovarian hemorrhage be thought of as a diagnosis. Simon⁷ emphasizes the important differential point that, in ovarian follicular hemorrhage, vaginal bleeding is always absent as contrasted with its frequent presence in cases of ectopic pregnancy. While the differential diagnosis from ectopic pregnancy may be only of academic and medicolegal interest, the differentiation from appendicitis is often of more importance on account of the type of incision to be employed. However, from personal experience as well as from a perusal of the reported cases it would seem that a positive diagnosis will seldom be made, a tentative diagnosis being the most that can be expected.

TREATMENT

It is probable that in many cases small hemorrhages occur, giving transitory symptoms, are relieved by palliative measures, and are never diagnosed. However, when the condition has progressed to a point where it has affected the pulse rate, operation is indicated. If the case has been diagnosed as an ectopic pregnancy or other internal hemorrhage, a midline incision will always be the incision of choice. When however, the case has been diagnosed as acute appendicitis, the lateral muscle splitting incision of McBurney will often be made. If blood is noted on opening the peritoneal cavity a search must be made beyond the appendix. In the case reported by Lurje,¹⁴ a twenty-three year old girl had her appendix removed through a McBurney incision and even though blood appeared in the wound the pelvic organs were not examined. Her symptoms continued and four days later she was reoperated upon, and old blood clots were removed which were coming from a small rupture of the *left* ovary. If the patient is not too stout and the incision is not too high, a rupture in the right ovary can often be taken care of through the McBurney incision as in my own case. However, there need be no hesitation in making a second incision in the midline as reported by Lassen.¹⁶ After exposure of the pelvic organs, conservatism should be the rule. Of the cases reviewed in the preparation of this paper, the ovary was removed in about two-thirds of the cases, resected in about one-sixth and in only the remaining one-sixth was simple suture of the rupture performed. It is my belief that these figures should and could be reversed. A carefully placed mattress suture, using a fine needle and thin pliable suture material, will probably control the bleeding in the large majority of the cases. When such a conservative measure fails, resection or removal of the ovary will have to be done. If the hemorrhage has been severe, transfusion from donors or autotransfusion of the blood from the abdominal cavity should be considered.

SUMMARY

Rupture of an ovarian follicle as a cause of profuse intraperitoneal hemorrhage is becoming increasingly important. It is usually diagnosed either as acute appendicitis or ectopic pregnancy since there is no pathognomonic sign of this condition. It occurs most frequently in the premenstrual period and should always be suspected in a virgin presenting signs of internal hemorrhage from no evident cause. The most common cause of the condition is probably an exaggeration of the normal ovulation especially if the follicular rupture involves a small vein as in the case here reported. The treatment is surgical as soon as the pulse rate is affected and the ovary should be retained if possible. Only in cases of hemorrhage uncontrollable by suture should the ovary be removed.

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MEDICAL ARTS BUILDING.

(For discussion, see page 128.)

A REPORT OF FOUR CASES OF UNUSUAL CONGENITAL DEFECTS*

BY CLIFFORD B. LULL, M.D., PHILADELPHIA, PA.

DURING the past year there have come under my observation several newborn children who presented anomalies which were incompatible either with life or with normal extrauterine development. A report of four of the more unusual ones forms the basis for this paper.

CASE 1.—*Congenital absence of the left femur.*

Mrs. F., aged twenty-nine, was seen when she was about three and one-half months pregnant for the first time. Her general condition was satisfactory and showed no signs of any organic disease. There were no symptoms of toxemia and the blood Wassermann was negative. Throughout her entire pregnancy she was rather difficult to handle, because of dietary indiscretions, giving rise to rather severe gastrointestinal symptoms. She was uncooperative as regards her diet and general hygiene, but did not develop any toxic symptoms.

She went into labor about three days beyond her expected time. She had a normal blood pressure and normal urine. The child was in the L.O.P. position, and the head well engaged. The first stage of labor lasted twelve and one-half hours, the second stage two hours, at which time the head was arrested at the transverse of the outlet, with the sagittal suture lying transversely. The labor was terminated by rotation of the head with forceps, median episiotomy, and forceps extraction. The third stage of labor was uneventful.

The child was a female, weighing 8 pounds, 4 ounces; it cried vigorously immediately after birth and was normal in every respect, except for the left lower extremity. This presented a rather unusual deformity, as the knee joint was attached to the hip on the left side and there was a marked clubbing of the left foot. The other extremities were normal. X-ray confirmed the diagnosis of absence of the left femur, and also showed an absence of the left fibula. The result is that this child has what looks like a normal knee joint coming from the hip on the left side, with a marked decrease in circumference of the lower leg and a marked clubbing of the left foot. This child is now six months old and has shown no other peculiari-

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tics or abnormalities and is thriving nicely. An orthopedic surgeon has seen the child and has advised amputation of the deformed extremity, as he feels that it can never be of any use; it acts as a foreign body and will be extremely detrimental as the child grows older. This is contemplated being done in the next few months.

The late Dr. DeForrest Willard reported before the American Surgical Association in 1900 a child who had a marked shortening of both femurs, which was corrected by orthopedic operations, so that the child was able to walk.

The etiology of this condition is, of course, rather obscure, but it was noted at the time of birth that the cord was wrapped around this extremity twice. The father was of unusually high-strung nervous temperament, and for the past two years before the birth of this child, he had been in generally poor health, due to a chronic infection of his frontal sinus. His Wassermann test and the spinal fluid Wassermann test were negative.

CASE 2.—Failure of kidneys to function at birth.

Mrs. S., aged twenty-three, with a negative family and personal history, was first seen when five months pregnant. She had felt well during her pregnancy except that during the first month or two she had had some bright red vaginal bleeding, for which her family physician had treated her by simple rest in bed. There had been no recurrence of this for the past two months and she showed no symptoms of organic disease. Her husband was a normal adult, in good physical condition. She progressed through her pregnancy in a perfectly normal condition and went into labor four days before the expected time of her labor.

At the onset of labor the child was in L.O.A. position, the head well engaged, and the membranes had ruptured prematurely. The first stage of labor lasted nine hours, during which time she had morphine and scopolamine 1/6 and 1/200. The second stage of labor was terminated by low forceps with median episiotomy. The child cried vigorously and examination showed no external deformities. Nothing abnormal was noted during the first twelve hours. At the end of that time it was reported that the child had not voided urine. The usual measures were instituted, including the relieving of a very marked phimosis, but with no relief. The baby was seen at this time by a pediatrician, who inserted a catheter into the bladder, but no urine was obtained. The child at this time was reported to appear to be toxic, but no definite cause seen. Intraperitoneal and subcutaneous injections of salt solution were given, together with fluid by bowel. No urine was passed during the next six hours and the child was again catheterized but no urine obtained from the bladder. The diagnosis of absence of the kidneys was made, and following several hours, during which the child had 6 convulsions, it died; at the time of death it was thirty-six hours old.

Autopsy performed by Dr. Waltz: The body is that of a newborn child, rather deep red in color, and shows no external signs of bruises or abrasions. It weighs seven pounds, four and one-half ounces and is 51 cm. in length. On opening the body, the subcutaneous fat is found to be about 5 cm. in thickness. The liver extends 3 cm. below the costal margin. The chest is normal in all respects. The right lung shows a small area of atelectasis in the lower lobe, about 1 cm. in diameter. Otherwise both lungs are of a deep pink color. The liver and spleen are grossly normal. The kidneys show fetal lobulation but are apparently normal to gross inspection. The blood vessels are normal in size and insertion. The ureters are normal, a small probe being easily passed the full length in the bladder. There is no dilatation of the ureters. The bladder contains about ½ c.c. of pale yellow urine. The thymus is small. The pancreas is gray, firm and normal in every respect. The stomach and intestinal tract are grossly normal. On opening the skull, the brain and meninges show nothing except very slight congestion. There is nothing demonstrable as a pathologic cause of death.

Sections of the kidneys show nothing strikingly abnormal in the tubules or glomeruli. There is a general congestion of a marked degree, being greater in the pyramids than in the cortex. However, the capillaries of the glomerular tufts and those among the tubules, contain many erythrocytes. The glomeruli show rather widened clear spaces between the capsule of Bowman and the tuft throughout the section. The smaller, or collecting tubules, show distinctly a clear lumen. The larger, convoluted tubules show practically no lumen, the epithelial lining being granular and swollen to such an extent as to occlude the lumen. However, this granular degeneration is not to such an extent as to obliterate the nuclei, as they stand out distinctly. The interstitial tissue and vessels are normal.

The result of this autopsy shows a perfectly normal urinary system, with normal development and normal circulation. Why the kidneys did not take on their function has not been proved.

CASE 3.—Congenital absence of the posterior and outer portions of the diaphragm on both sides.

Mrs. M., aged thirty-six was seen when eight weeks pregnant. Her past history was negative as far as any serious illness. Her menstrual history was normal. There had been two previous pregnancies: one child, eleven years old, perfectly normal. Two years previously she had given birth to a child at approximately full term, which only lived a few hours. The attending physician had signed the death certificate as an "enlarged thymus."

Examination showed a pregnant uterus, with a small interstitial fibroid in the fundus about the size of an orange. There was some laceration of both the cervix and the pelvic floor. Blood pressure and uranalysis were normal and the Wassermann test negative. During the rest of her pregnancy the uterus enlarged normally and the patient had no signs of toxemia.

This patient went into labor twelve days before her expected time and was delivered spontaneously of a small male child after two hours of labor. The child made no effort to breathe after delivery, but the heartbeat was regular and full. The administration of carbon dioxide with alpha-lobeline and atropine injections were of no avail. Artificial respirations were instituted and after a short time the more vigorous methods of resuscitation were resorted to. The heart beat for fifty-five minutes following delivery, during which time there was no effort at the establishment of the respiratory function.

Autopsy performed by Dr. Waltz: The body is that of a newborn babe, which shows a rather small head, with lowered eyebrows and depressed bridge of the nose and a peculiar increased thickness about the wrists and ankles. The body is heavily covered with a thin, fuzzy hair. On opening the abdomen it was found to contain 50 c.c. of a thin, blood-tinged fluid. At first appearance the liver appears to be on the left, where it extends slightly below the costal margin. A closer examination, however, reveals the fact that the diaphragm on both sides is incomplete, being but a narrow band attached to the anterior thoracic wall and the vertebral column in the midline. There is no attachment on the outer and posterior surface of the thoracic wall on both sides. On the left side a considerable amount of the intestinal tract, including the stomach, a large portion of the small intestine and part of the colon are in the thoracic cavity, as is also part of the left lobe of the liver. Practically the entire right lobe of the liver is in the right thoracic cavity. The heart is very small but to all appearances is anatomically normal. The lungs are extremely small and arose well up in the mediastinum and are completely atelectatic, containing no air in any part. The spleen is found in the left thoracic cavity, otherwise normal. The kidneys and the ureters are normal. The bladder contains about 10 c.c. of cloudy amber urine. The intestinal tract shows the usual meconium and to

gross appearance is normal. The brain shows marked congestion of the vessels; there is, however, no hemorrhage.

Congenital complete absence of the diaphragm is a very unusual condition. Numerous cases of absence of one or the other leaflet are seen quite frequently. Although there was a small ridge of tissue, which was unquestionably a small vestige of diaphragmatic formation, there was no attempt for it to develop on either the right or the left side.

There is a peculiar family history associated with the father's side. There were four brothers, all of whom were married, all of whose wives have borne children, but all the male children have died, either at birth or shortly after birth. The female children were all vigorous and normal in every respect.

CASE 4.—*Cerebral hemorrhage in the newborn.*

Mrs. S., aged twenty-six, was seen when she was four months pregnant for the first time. Her family history was negative, but she gave a distinct history of rheumatic fever and frequent attacks of tonsillitis. The tonsils had not been removed. Examination showed markedly diseased tonsils, a heart which was distinctly enlarged and a very distinct systolic murmur at the apex. There were no signs of decompensation.

Examination of the abdomen and pelvis was negative except for the presence of the pregnancy. This patient was immediately placed in the hands of an internist, Dr. Robert P. Register, who had the patient under his observation during the rest of her pregnancy. At six and a half months of her pregnancy, the patient, although she had been cautioned against hurrying, walked very rapidly two blocks to catch a street car and very suddenly became faint and noticed a peculiar pounding sensation over her cardiac area. She was taken home and immediately placed in bed, where it was found that there was marked fibrillation present. She improved under rest and medication but was kept confined to her room, and most of the time, in bed, during the rest of her pregnancy. The fibrillation of her heart recurred from time to time, but she had no edema or other signs of cardiac failure.

Because of her cardiac condition it was thought best to terminate the pregnancy by cesarean section under local anesthesia. When she was within five days of full term she was admitted to the hospital. Electrocardiographic studies of her heart were made, which showed fibrillation at the time, with some myocardial degeneration. The operation was performed under $\frac{1}{2}$ per cent novocain infiltration anesthesia. The type operation done was the so-called "classical cesarean section." There was nothing unusual about the performance of the operation, and the child was extracted without giving the patient any disturbance. During the operation, there was a pulse deficit of about 40 beats per minute, the blood pressure remaining at about 130/80. The child cried vigorously as soon as it was delivered and it was transferred immediately to an electrically heated crib in the operating room. A rather large amount of mucus was removed from the throat at this time by suction, but no manipulations had to be resorted to. The crib was transported to the nursery without removing the child from it. Thirty minutes later, before the child had been bathed or handled, it was noticed that there was some cyanosis present, and orders were given to elevate the foot of the crib and that the child should not be bathed or handled in any way. Four hours later, after recurring attacks of cyanosis and respiratory difficulty, a cisterna puncture was done, which gave very highly blood colored fluid. Repeated cisterna and lumbar punctures were done during the three days that the child lived, each time giving temporary relief from the cyanosis and respiratory difficulty. There was no bleeding from any of the mucous membranes of the body. The bowels moved and the kidneys functioned. During this time the child was fed through a tube. It died on the third day. No bleeding time was obtained.

Autopsy performed by Dr. Waltz: The body is that of a newborn babe. The body is a well developed male. There are no external bruises or abrasions. The autopsy, being limited to the head, only a skull cap incision was made. On opening the skull along the line of sutures, the subdural space was found to contain a considerable amount of unclotted blood on both sides. On the right side there is a clot over the anterior part of the temporal lobe, near the foramen magnum. There is also a small clot on the same side over the temporal lobe. The vessels are all markedly injected. No other abnormalities were noted. Sections of the brain made from the area of the clot show nearly all vessels markedly distended with blood. This is especially true of the small veins, as a few of the arteries are not so distended. There can be no doubt that these vessel walls, consisting only of an endothelial lining, with very little supporting elastic tissue, are much thinner than normally seen in vessels of similar size. The question arises, however, are these vessels distended because the walls are weak, or are the walls thin because of some undiscovered reason? There is an extravasation of blood between the layers of the pia-arachnoid. The larger clots are apparently under the pia, elevating it from the cerebellar surface and dipping down into the sulci.

This child unquestionably died of a cerebral hemorrhage. The etiologic factor is very much in doubt. Although the child was presenting in a vertex presentation, the head was not in the pelvis, and the patient had had no labor pain at the time of operation. Traumatism at the time of delivery, I think can be ruled out, because, obviously, when a child is extracted from the uterus while working under a local anesthesia, it certainly must be done with the greatest gentleness. The incision in the uterus was ample for the head to come out easily. The question always arises in these cases whether or not the child was dropped, but it was placed in the crib under my own observation in the operating room and had not been handled previously to the onset of symptoms, as it had not been bathed before it was seen and before leaving the hospital at that time.

Numerous cases of cerebral hemorrhage have been reported following the birth of children by cesarean section, but in all of these cases the patient had been in labor or the traumatism to the head could be accounted for by the extraction from too small an incision in the uterus. Most authorities consider traumatism a basic etiologic factor in all these cases, but also admit that abnormalities in the blood-vascular system have a distinct bearing on this condition. Children born of mothers who suffer from toxemia of pregnancy or some other chronic constitutional disease are certainly more prone to suffer from this condition. I am placing this case on record because I believe that the traumatic factor can be eliminated.

REPORT OF A CASE OF TOXEMIA OF PREGNANCY AND ACCIDENTAL HEMORRHAGE, WITH AUTOPSY FINDINGS*

By JULIUS KURZROCK, M.D., NEW YORK, N. Y.

(From the Obstetrical Service, Harlem Hospital)

MRS. L. P., colored, 30 years of age, was admitted to the Obstetric Service of Dr. Kassebohm at Harlem Hospital on Aug. 30, 1928, at 6 p.m.

Her past history was irrelevant. There had been three previous pregnancies, all of which terminated in normal spontaneous deliveries at term. She was 7½ months along in her fourth pregnancy and had had no prenatal care.

Three days prior to admission she fell a few steps on the stoop of her house striking both knees. There were no ill effects from the fall. On the day of admission the patient vomited, bled slightly from the vagina, and developed abdominal pain. When first seen, the patient appeared to be in moderate shock, the temperature was 102°, pulse 120 of fair quality, and her blood pressure was 240/180. Physical examination was negative. The uterus was enlarged to the size of a 7½ months' pregnancy corresponding to her period of gestation, extremely tender, hard and board-like, making it impossible to outline the fetus. The fetal heart could not be heard.

The patient was having severe and continuous pain. Bleeding was moderate, and on vaginal examination the cervix was found to be two fingers dilated with no evidence of placenta previa. Only a few ounces of urine were obtained by catheter, the analysis of which showed 4 plus albumin with hyalin casts. There were 4,200,000 R.B.C. per cu.mm., and the hemoglobin was 65 per cent.

A diagnosis of premature separation of a normally implanted placenta was made. A No. 4 modified DeRibes bag was immediately introduced. This was expelled in five minutes and the cervix was then four fingers dilated. The membranes were now ruptured artificially, and a considerable amount of bloody fluid escaped. Uterine contractions were vigorous and the patient promptly expelled a dead fetus weighing 3 lb. 9 oz. The placenta had completely separated and was found lying free in the uterine cavity. It was removed manually with several large blood clots. The uterus remained soft and the patient was bleeding freely. One c.c. of pituitrin and 1 c.c. of gynergen were given hypodermically, and the uterus and vagina were packed with iodoform gauze. Fifteen hundred c.c. of normal saline solution were given intravenously. Two hours later the patient was given a 500 c.c. blood transfusion. There was continuous oozing through the packing in spite of repeated doses of pituitrin and gynergen.

At 11 p.m., 5 hours after admission, the blood pressure was 110/80, pulse 140 and irregular, and the patient's general condition was bad. The uterus was soft and boggy and reached the free margin of the ribs. The packing was removed, and the uterus and vagina were tightly repacked. The bleeding promptly ceased, and the uterus contracted firmly to one finger below the umbilicus. The blood pressure was now 70/40, and 500 c.c. of citrated blood were given intravenously, and 1000 c.c. of 5 per cent glucose solution were given under the skin.

The next morning the patient was in coma. Her blood pressure was 108/80, pulse 150, and her temperature was 103°. The patient was catheterized at this

*Read before the section of the Obstetrics and Gynecology of the New York Academy of Medicine, Nov. 27, 1928.

time and several times during the day, but no urine was obtained. A blood chemistry showed 30 mg. of urea nitrogen, 5 mg. of creatinine and glucose 200 mg. The uterus was firmly contracted at the level of the umbilicus, and there had been no bleeding since the uterus was repacked.

On the second day postpartum there developed a flaccid paralysis of the right upper and lower extremities with loss of reflexes. A spinal tap was done showing clear fluid under normal pressure and a count of 80 cells mostly lymphocytes, sugar plus and a normal globulin.

For the next 24 hours the coma continued. No urine was obtained. The patient became very restless and noisy. The temperature remained elevated and the pulse rapid. Five c.c. of smoky urine were obtained by catheter. The specimen showed a large amount of albumin and blood. No casts were found. At 6 P.M. on the fourth day postpartum the patient died.

An autopsy was performed. The liver was markedly hemorrhagic. The areas of hemorrhage varied in size and were very numerous and under the capsule.

The uterus showed macroscopic and microscopic areas of hemorrhage under the peritoneum and throughout the musculature. The muscle bundles were separated by infiltrated blood. The hemorrhage extended into the folds of the broad ligament.

The kidneys showed gross evidence of congestion and inflammation.

The interesting features of this case are:

1. The clinical diagnosis of accidental hemorrhage (ablatio placenta) was borne out by the pathologic condition of the uterus.
2. The clinical diagnosis of toxemia of pregnancy was borne out by the pathologic condition of the liver.
3. Accidental hemorrhage and toxemia of pregnancy are usually correlated.
4. Toxemia was the cause of death, although the patient's life had been threatened by hemorrhage.
5. The uterus though markedly apoplectic, contracted firmly, and was safely left in situ.

545 WEST END AVENUE.

Malfatti, J.: Treatment of Vaginal Discharge With Normolactol. *Wien. klin. Wchnschr.* 42: 19, 1929.

On the theory that vaginal discharge is often the result of decrease in acidity of the normal vaginal secretion, normolactol, a mixture of lactic acid and sodium lactate made up so as to have a P_H of 3.7 has been used over a period of two years. It is applied to the vagina either in solution as irrigations through a speculum, or as a tablet which produces no discomfort when inserted. The author reports a clearing up of symptoms, as well as, in suitable cases, a change in the flora to Reinheitsgrad I. This treatment is efficacious only in the cases of "clear" vaginal discharges. Discharges due to acute and chronic pelvic inflammatory conditions, injuries of any kind, or chronic irritation are not affected.

FRANK SPIELMAN.

REPORT OF A CASE OF AN UNUSUAL VENTRAL HERNIA FOLLOWING REPEATED CESAREAN SECTIONS

By PHILIP OGINZ, M.D., F.A.C.S., BROOKLYN, N. Y.

A WHITE woman, twenty-five years of age, was admitted to the obstetric ward at the Kings County Hospital on December 28, 1928.

The patient was pregnant; and, because of the fact that three cesarean sections had already been performed upon her, she desired to place herself under our care before going into labor.

Her history revealed the following points of interest:

Rickets.—She had been breast fed during her first year. She was unable to walk until the age of five, and was bow-legged as a child.

Tuberculosis.—She was one of a family of eleven children, five of whom are living at the present time. A sister had died at the age of seventeen, from pulmonary tuberculosis. Four of the children had died in infancy, causes unknown. Several members of the family had been killed in an accident. None of the five surviving members are very robust.

The patient herself was underweight and gave a history of excessive night sweats, and an inability to gain weight.

The patient's husband, to whom she had been married five years, gave a history of poor appetite, frequent colds, both winter and summer, and hemoptysis four years ago.

Menstrual History.—The patient began to menstruate at the age of thirteen, flowed four days, and had her periods every twenty-eight days. The menstrual cycle was established without any undue symptoms. The flow was profuse and accompanied by slight first day pain. Her periods were slightly irregular with respect to amount of bleeding and number of days of menstrual cycle before marriage, but since marriage her periods have been regular. Her last period occurred some time in April, 1928; hence, the estimated date of confinement was some time in January, 1929.

Obstetric History.—The patient had been pregnant three times prior to the present pregnancy, all terminated by cesarean sections.

Her first pregnancy resulted in a full-term live baby; the operation was performed at Johns Hopkins Hospital, May 12, 1925. The patient was not under a doctor's care when she went into labor, but had utilized the service of a midwife. After being in labor for about eight hours, the midwife ruptured the membranes. After several more hours of waiting, the patient was taken to the hospital and a live child was obtained by cesarean section. She remained in the hospital two months; the abdominal incision was opened twice, and drainage tubes were inserted. She had fever and was very sick during this time. Her abdomen was of normal contour during the course of her pregnancy.

Her second pregnancy resulted in a full-term live baby also delivered by cesarean section, at our hospital. The patient was in bed two weeks after operation, but was without fever. She had one month of antepartum care. The abdomen was not of normal contour, but no definite hernia was present.

The third pregnancy resulted in a premature baby which survived the operation two hours. The patient had a bad fall down several steps during the eighth month of the pregnancy. She was in bed for two weeks after the operation. She had received three weeks of antepartum care.

Physical examination showed the patient to be a fairly well-nourished woman, about 5 feet tall, weighing 115 pounds. No physical signs of interest were revealed until the abdomen was examined.

The abdomen was of large size and of very irregular shape. There was a separation of the recti muscles below the umbilicus, which was so extensive as to permit the entire fetal head to protrude through the opening. When the patient was in the recumbent position, the head was palpated with such facility that it was possible to identify the sutures. The only intervening structures between the fetal head and the examining fingers were skin, peritoneum, and thinned lower uterine segment and fetal membranes, the thickness of the whole not being in excess of about $\frac{1}{8}$ of an inch. By abdominal palpation of the head, a diagnosis of right occiput posterior was established, and confirmed by x-ray.



Fig. 1.

When the patient was examined in the erect posture, the profile of the abdomen showed a large globular mass pushing the abdomen forward, below the umbilicus. In this position, palpation of the fetal head was even easier. The pelvic measurements were as follows: interspinal, 25 cm.; external conjugate, 16 cm.; true conjugate, 8.0 cm.; intereristal, 24 cm.; diagonal conjugate, $10\frac{1}{2}$ cm. Typo of pelvis: rachitic flat.

The patient was advised to enter our antepartum ward for observation prior to her delivery. In view of the fact that three sections had already been done, the patient was told that a sterilization would be advisable.

Although I prefer waiting for the patients to go into labor before sectioning, I feared to do so in this case on account of the extreme thinness of the lower segment of the uterus.

Spinal anesthesia was the anesthetic of choice. A low cervical two-flap operation was performed, delivering a seven and a half pound female child. The placenta

was delivered by Credé method. The scars of the three previous sections were all visible and had undergone excellent repair; but, as we expected, there were very many strong adhesions between the uterus and omentum, especially marked on the left side. A number of these were ligated and cut.

The edges of the fascia were brought together, and then overlapped for about 2 inches, giving the area in line of incision a double layer of fascia. About 3 inches of redundant skin fascia and peritoneum were first cut away.

The patient made an uneventful recovery.

861 ST. MARKS AVENUE.

A PERMANENT RECORD OF THE UTEROSALPINGOGRAM

By ALBERT MATHIEU, M.D., F.A.C.S., PORTLAND, OREGON

IT IS obvious that mere dictation from an x-ray film cannot possibly render complete satisfaction in later studies of a given case record. It is also highly impractical to search for, or even keep on hand, all



Fig. 1

of one's radiograms. For these reasons it has been my custom for some time to make an orthodiagram of the x-ray film as soon as it is dry. The film is merely attached to a shadow box, a very thin piece of typewriter paper placed over it, and a complete tracing of the im-

portant contrasts made with a soft carbon pencil. We include a schematic outline of the pelvic inlet, and a dotted line to indicate the midline of the sacrum. As stated before, this is done as soon as the

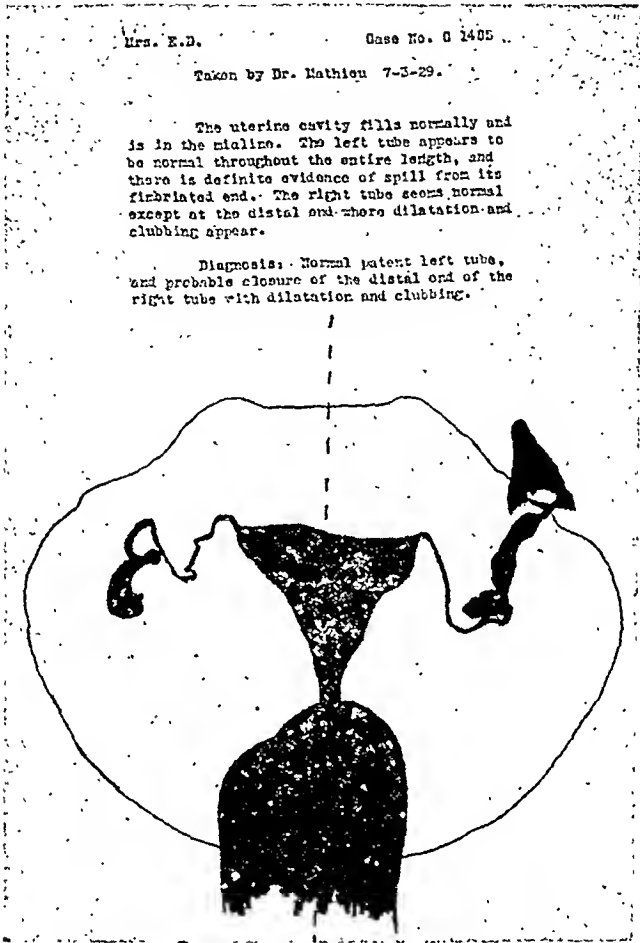


Fig. 2

film is dry so that all the facts are fresh in our minds, and as soon as the tracing is completed, the permanent data is typewritten on the same page. Then the whole is sprayed with Fixatif to prevent blurring of the image. (Figs. 1 and 2.) In this manner the entire data of the uterosalpingography is at hand and incorporated in the case record.

A CASE OF ACCESSORY CLITORIS

BY GEORGE A. WILLIAMS, M.D., ATLANTA, GA.

(From the Emory University Division of Grady Hospital)

ABNORMALITIES of the clitoris are by no means rare, but they are usually associated with stigmas of epispadias. Under such conditions there is an arrest in the fusion of the two corpora cavernosa clitoridis; a maldeveloped body lies on each side of the genital cleft



Fig. 1.—External genitalia after adhesions were freed from glans of accessory clitoris.

and the intervening space varies with the degree of epispadias as represented by exstrophy of the bladder and absence of the symphysis pubis. The features of the case herein reported differ radically from such findings, however, and are difficult to explain through embryologic phenomena.

CASE REPORT

A well-developed, well-nourished colored primipara, aged twenty-two years, was seen in the prenatal clinic in April, 1925. The pregnancy was normal and nothing unusual was found except for the peculiar condition of the external genitalia.

On casual inspection the vulva appeared to be normal, but on separating the labia minora a small cleft about 2 cm. in length was seen in the midline of the vestibule just below the frenum of a normally situated clitoris. Further separation of the labia induced a parting of the lips of the cleft, and a small rounded prominence resembling a minute glans clitoris appeared in the upper portion thereof. The lips of the cleft were lightly adherent to this body. The adhesions were liberated by gentle probing, and a small amount of smegma was removed from the corona. The glans surmounted a shaft of similar proportions which on palpation was found to extend toward the symphysis pubis; but, on account of the small size, the exact attachments could not be determined.

Libido was said to be normal; and although, for some time, the patient had been aware of the erectile body in question, she had never questioned its presence being normal.

1121 CANDLER BUILDING.

AMNIOTIC TROCAR

BY LESTER A. WILSON, M.D., F.A.C.S., CHARLESTON, S. C.

(*Professor of Obstetrics, Medical College of the State of South Carolina*)

THE instrument herein illustrated has a hidden point for rupturing the fetal membranes guided by rectal examination. A sliding movement of the button situated on its handle projects the point, beyond the end of the trocar. The cervix and membranes are located by rectal examination after which the instrument is introduced vaginally against the membranes, and the point pressed forward. The membranes are then ruptured by a gentle movement of the instrument.



Fig. 1.—Trocar about one-third actual size.

This trocar can also be used for rupturing the bag of waters by vaginal examination. It is especially valuable where it is desired to rupture before the cervix is fully dilated, for the purpose of intraovular insertion of the hydrostatic bag or when labor is to be induced by the rupture method.

This instrument can be obtained from the Geo. P. Pilling & Son Co., of Philadelphia, Pa.

105 RUTLEDGE AVENUE.

A DEVICE WITH FIXED SAFETY LIMITS FOR THE RUBIN TEST

BY H. M. JONES, M.D., RIVERSIDE, ILL.

THE gas insufflation method of determining uterotubal patency was originated by Rubin in November, 1919.

Appreciating the increasing use of the Rubin test, Stone, of the University of Illinois College of Medicine, called my attention to the very definite need for a device whose control mechanisms and technic would be such that the operator would have no choice between careful and careless control of the danger factors, and such that the test would not require the services of two operators—one to watch the apparatus, and one to keep the patient under observation during the test.

Rubin has repeatedly pointed out the importance of regulating the rate of pressure increase, the total pressure, and the total volume of gas used when preparing to drive CO₂ through the uterus into the fallopian tubes.

He specifies (1) that the rate of pressure increase should be not more than 100 mm. Hg per 30 seconds; (2) that the pressure used should not exceed 250 mm. Hg, and (3) that the total volume of CO₂ used should not be more than four siphon excursions, or 160 c.c.

Regulating the rate of pressure increase to 100 mm. Hg per 30 seconds eliminates, to a great extent, the error in diagnosing nonpatency following uterotubal spasm, which is frequently induced by a sudden stretching of the uterotubal musculature with a sudden forcing of CO₂ into the uterine cavity.

The maximum pressure to be used he sets at 250 mm. Hg for the reason that the accumulated results from thousands of tests have shown this to be a safe pressure against the accident of tubal rupture, and also that tubes, nonpatent at 250 mm. Hg of pressure, cannot be made to register patency at higher pressures. In other words, this maximum pressure is safe and yet high enough.

The total volume of 160 c.c. of CO₂ has been found sufficient clearly to demonstrate subdiaphragmatic pneumoperitoneum by roentgenogram, even on fat subjects, and yet to cause no excessive pain even to thin subjects. Here again the volume of 160 c.c. is found to be safe and yet sufficient.

Heretofore, with the dozen or more modifications of apparatus used for making this test, the danger factors left to the care of the operator are:

(1) Adjusting the rate of pressure increase by valve control, and by counting the number of gas bubbles per minute, or other methods, as air syringes, blood-pressure bulbs, etc.

(2) Keeping constant watch on the rising pressure so that the maximum pressure shall not exceed 250 mm. Hg, while being obliged, at the same time, to guard against leakage of gas at the cervix and also at the same time, to listen by stethoscope for the characteristic sound heard when gas presses through the tubes.

(3) Measuring, by counting, or other methods, the volume of CO₂, or air, driven through the tubes, so that the total volume would not exceed 160 c.c. (I saw the roentgenogram of one patient who had been insufflated with about a gallon and a half of CO₂ through oversight on the part of the one who was supposed to have counted while the test was being made.)

By such methods, care of the danger factors divides too much the attention of the technician. It is almost a human impossibility to concentrate on such technical details as guarding against gas leakage at the cervix, listening by stethoscope for a

faint sound, counting gas bubbles, and mentally recording a changing pressure level—all within the same instant—with any degree of confidence in the final result.

The apparatus here described requires a technic which leaves the operator entirely free to concentrate on the most important single feature of the test, namely, to observe that the characteristic high-pitched sound of gas passing through the tubes is heard at the exact instant that the pressure curve on the tracing breaks its perfectly even, straight course. Also, its design is such that the test stops and the CO₂ supply is cut off from the patient at any point where neglect of any single safety factor is overlooked, neglected, misunderstood or forgotten by the technician.

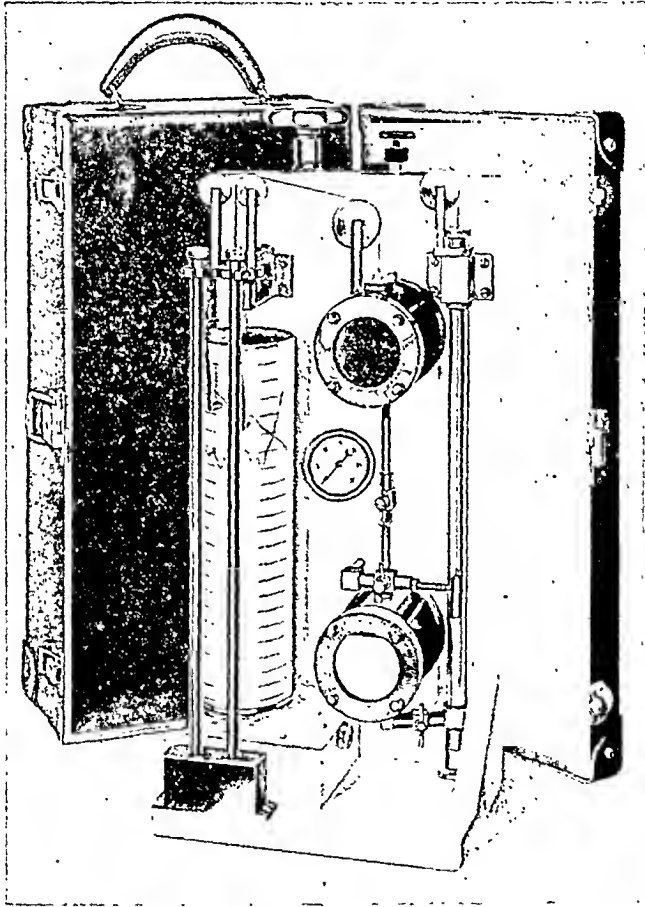


Fig. 1

DESCRIPTION OF THE APPARATUS

Briefly, the principle used by this device for limiting the gas flow so as to secure the quantitative requirements of 250 mm. Hg maximum pressure, 100 mm. Hg per 30 seconds maximum rate of pressure increase, and 160 c.c. maximum volume, is as follows:

The lower glass windowed cylinder is a carbon dioxide mercury trap of 160 c.c. capacity; the upper one, of the same capacity, is virtually the mercury overflow container, the two being connected in a manner such that when the lower chamber is filled with the mercury and the CO₂ pressure is turned on, this mercury is driven by pressure upward into the upper chamber.

Thus the displaced mercury now entirely fills the upper chamber, while CO₂, which has displaced the mercury, now entirely fills the lower chamber, and the volume of this CO₂ being that of the chamber (160 c.c.) it is obviously impossible for the technician to insufflate the patient with more than 160 c.c. of gas.

The slight pressure still remaining in the lower chamber is now relieved to the outside air an instant before, and by the same motion which turns the valve, connecting to the patient this 160 c.c. volume of CO₂.

All being in readiness for the test, the mercury is then allowed to flow back again into the lower, or CO₂ chamber, the rate of flow of the mercury being limited by the size (No. 60 size drill) of the hole drilled in the valve which permits it to enter the lower chamber.

As the mercury level rises in the lower chamber, it puts a squeeze upon the CO₂ now trapped in this chamber, the measure of this squeeze, or pressure, being registered by the manometer, and in turn, recorded by ink tracing on the kymograph drum.

Thus, the maximum rate of pressure increase (100 mm. Hg per 30 seconds) is obviously fixed by limiting the size of the hole, which permits the mercury to flow downward into the gas trap, and it is, therefore, beyond the control of the technician to exceed this rate.

The maximum squeeze, or pressure, in mm. Hg possible to exert by such an arrangement is also, obviously, limited by the height (in mm. Hg) of the mercury level in the upper chamber above the level of the mercury in the lower chamber.

These two chambers are, therefore, purposely placed one above the other, at a distance such that, as their mercury levels change, they are at no time more than 250 mm. apart, thus permanently fixing the maximum pressure possible to put upon the CO₂ gas. In other words, the device offers to the technician no physical means of exerting pressure on the CO₂ gas except through the squeeze placed upon it by this difference in mercury levels, which, as stated above, is limited to 250 mm. The pressure, therefore, begins at zero and very gradually climbs to this limit of 250 mm. Hg (provided, of course, there is occasion to use this degree of pressure).

Summarizing: (1) The size of the chamber (160 c.c.) limits the volume of gas to the safe limit of 160 c.c.; (2) the size of the hole drilled in the 2-way valve, which permits the mercury to flow downward limits the rate of pressure increase to the maximum of 100 mm. Hg. per 30 seconds, and (3) the height of one chamber above the other limits the pressure possible to be developed by such a device to the maximum limits of 250 mm. Hg.

SPECIAL FEATURES OF THE DEVICE

The apparatus is also equipped with certain other devices to facilitate smoothness in technic:

(1) The self-retaining type of cannula devised and described by Stein and Ahrens¹ is used with the apparatus, and has greatly facilitated the technic for leading the gas from the CO₂ chamber into the uterine cavity.

This type of cannula practically insures a gas-tight connection at the external os, which is obviously essential for a faithful recording of the behavior of the tubes under gas tension.

By having the patient with head tilted slightly below the horizontal, the connection of the cannula into the os may be immersed under water by simply pouring into the vagina enough water for that purpose, thus providing a positive check against errors in diagnosis from undetected gas loss at the cervix.

By stethoscope, the characteristic sound of the gas passing through the tubes—a sound unlike any other heard in the abdomen, starting in at a high pitch, continuing for two or three seconds, then rising to a still higher pitch and ending

suddenly, with repetitions not unlike the high pitched, long drawn out yelping of a dog, is diagnostic of patency. It occurs simultaneously with the changes in contour of the tracing.

In cases with marked laceration, such that gas leakage at the cervix cannot be entirely stopped, the sound (by stethoscope over the abdomen) of the gas leakage at the cervix, and the changes in contour of the tracing, are somewhat similar to those observed in patency. In such cases, therefore, the question as to whether or not gas has passed through the tubes must be decided by the typical shoulder pain, or by roentgenogram of the characteristic subdiaphragmatic pneumoperitoneum for the clear-cut demonstration of which one will require a gas bubble of about 100 to 150 c.c. if the thorax is of large anteroposterior diameter.

(2) The value of a kymograph record of the test has been emphasized by Rubin.² From the different types of graphs obtained from different patients, it is possible to differentiate between (1) normal patency; (2) varying degrees of stenosis; (3) tubal spasm, and (4) complete occlusion, and to record the behavior of normally patent tubes and tubal peristalsis.

The kymograph records (1) the volume of CO₂ insufflated, (2) the rate of pressure increase per unit of time, (3) the pressure level at which patency appears, and (4) the variations in tubal peristalsis in normal and abnormal tubes.

Repeated monthly tests, a few days postmenstrual, for three or four months in succession, probably offers the most hope for the use of the test in the treatment of sterility resulting from tubal spasm or from possible slight adhesions around the tubes, or inspissated mucus within the lumen.

In such a succession of tests on the same patient, a series of graphic records of the variations in patency pressure levels observed at each test (especially when the pressure at which gas passes becomes successively lower by steps at each application of the test) is most convincing and instructive.

Rubin believes that such permanent records are desirable and essential for future reference in any kind of a scientific investigation of the mechanical aspects of sterility.

The use of air syringes, blood pressure bulbs, and other air pressure devices miss the point entirely. They permit of too great variation in the rate at which the pressure is applied, too frequently induce tubal spasm, give opportunity for the insufflation of unmeasured and excessive volumes of air which are unnecessarily painful to the patient, and leave no record of the response of the tubes to the pressure used, which responses, in themselves, have true diagnostic value.

(3) The clock mechanism of the kymograph is practically noiseless and will run for 300 to 400 tests with one winding, the winding being done by a very small clock key.

(4) The device is equipped with a standard tank providing CO₂ sufficient for between 500 and 600 tests from one filling. CO₂ is the gas of choice, since it is absorbed quickly from the peritoneal cavity and thus gives quick relief from the phrenic reflex shoulder pain complained of in 90 per cent of patients.

(5) The apparatus is readily portable, weighs about 15 pounds and, for transportation, the mercury can be locked securely in the lower chamber by the three valves of the apparatus.

(6) In those cases proved nonpatent by the gas insufflation procedure, if operation for opening the tubes is contemplated, the point of obstruction may be visualized by roentgenogram of the tubes filled with iodized oil.

The simplest device possible, namely an ordinary 10 c.c. graduated pipette inserted in series with the CO₂ chamber and the self-retaining cannula—serves for instilling Ipiodol or iodized oil in measured amount, and under gradual, safe pressure limits.

(7) When turning on the CO₂ gas from the high pressure tank, positive and fine control is provided by a needle-valve. To visualize the pressure working to drive the mercury up into the upper chamber, a 30 pound gauge is used. A 5 pound pressure is sufficient, and if more pressure is accidentally admitted, a relief valve holds the pressure to less than 10 pounds.

(8) To avoid breaking the mercury column between the two chambers, and also to permit rapid upward flow of the mercury (through a hole larger than the No. 60 hole in the valve) that is, when driving the mercury by displacement upward from the lower chamber, a small metal tube (inside the larger one connecting the two chambers) with its lower opening placed at just the correct level, dissipates the pressure at the point just before all of the mercury has left the lower chamber, thus automatically blowing off the gas pressure, and, at the same time, stopping the upward flow of mercury from the lower chamber.

(9) To prevent any chance of over-insufflating the patient through a direct connection between patient and CO₂ supply, through oversight on the part of the technician, a special valve is used, such that in one position of this valve, the CO₂ is admitted to the CO₂ chamber; in a second position it blows off any possible residual pressure, while in a third, it turns the CO₂ to the connection leading to the patient.

(10) To prevent driving the mercury out through the manometer by the same CO₂ pressure which is used in driving the mercury up into the upper chamber, the valve which shuts off the manometer cannot be inadvertently left open, because, through this same valve, is obtained the pressure supply, and the valve, therefore, must be turned to its safe position before the pressure will flow.

Thus, with the safety limits of gas volume and pressure so fixed beyond the chance for harm to the patient, and the apparatus so protected against damage to itself, the technician is, at every turn, confronted with the rather novel situation that he has no choice between correct and almost correct technic.

The results of tests made by Doctor F. Lee Stone of the University of Illinois College of Medicine at the Research and Educational Hospital of the State of Illinois with this apparatus on over a hundred cases, including observations on the therapeutic value of the test, indications, contraindications and other points of practical interest, will be the basis of a future report.

REFERENCES

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Naujoks, H.: Genital Hypoplasia. Arch. f. Gynäk. 135: 58, 1928.

The author is of the opinion that the condition of genital hypoplasia is a regional finding with a definite geographic distribution, such as goiter, osteomalacia, hyperemesis, etc. In Koenigsberg the incidence of genital hypoplasia was 1 per cent, in Halle 1.2 per cent, and in Marburg 3.6 per cent. Of the 106 patients studied, 40 complained of dysmenorrhea, 17 of excessive and irregular periods, 12 of amenorrhea, 4 of scanty and irregular periods, and 4 of sterility. Examination showed 50 per cent of the patients to be asthenic in type. The heart was invariably found to be small, and the blood picture was always infantile in type; that is, a slight anemia with a monocytosis. This type of genital hypoplasia is usually due to a hypoplasia of the entire organism following exogenous causes, such as prematurity, severe childhood diseases, tuberculosis; or following endogenous causes, such as inherent weakness of the germ plasm, in breeding, etc.

RALPH A. REIS.

A NEW PELVIMETER FOR THE MEASUREMENT OF THE BISPINOUS DIAMETER

BY SAMUEL HANSON, M.D., STOCKTON, CALIF.

(From the San Joaquin General Hospital)

THE importance of outlet pelvimetry is now generally recognized. A simple and accurate method is, however, not yet available. This is particularly true of the bispinous diameter.

In the methods hitherto proposed the attempt is made to reach both spinous processes simultaneously, through the vagina. This is difficult to accomplish even under the most favorable circumstances. A solu-

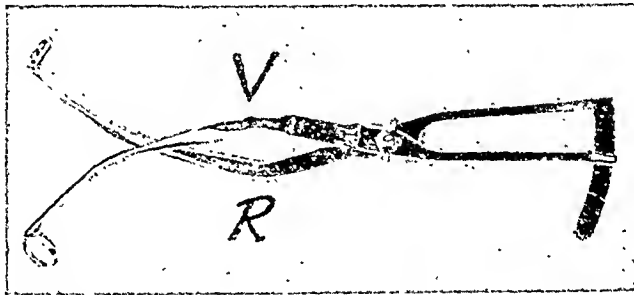


Fig. 1.—V, left or vaginal blade; R, rectal blade. Scale: reduced plates are $\frac{1}{4}$ actual size.

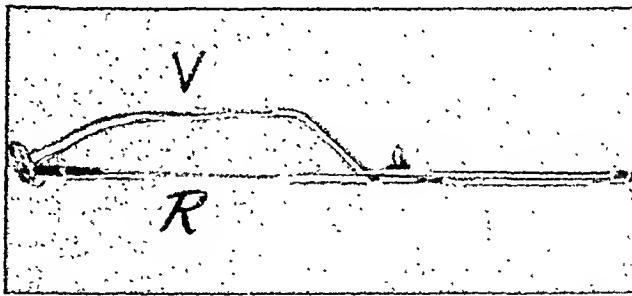


Fig. 2.—Lateral view, showing curvature of vaginal blade V.

tion of the problem is attempted in the method here described by the introduction of one arm of the instrument into the rectum while the other arm is within the vagina.

The instrument consists of two detachable curved blades, joined crosswise to resemble a pair of scissors (Fig. 1). The curve of the left blade is such (Fig. 2) as to permit its ready manipulation within the vagina while the right blade is within the rectum. A ring is attached to that end of each blade which is to be used internally. The right

blade carries a scale at the opposite end from the ring. The smallest divisions on this scale represent a distance of 0.5 em. between the rings.

The tip of the middle finger of the right hand is inserted into the ring of the left blade. With the blade in place the index and middle fingers are introduced into the vagina. The tip of the index finger of the left hand is similarly placed within the ring of the right blade, and is introduced into the rectum. The two blades are now locked, and the



Fig. 3.—Measurement of the bispinous diameter with the right middle finger guiding the left blade within the vagina, and the left index finger directing the right blade within the rectum.

spinous processes are identified. The rings are then gently steadied against the spinous processes (Fig. 3), and a reading is made on the scale. The value obtained represents the distance in centimeters between the ischial spines.

The instrument can be applied very easily and almost painlessly even in the nulliparous woman.

1009 MEDICO-DENTAL BLDG.

A SIMPLE AND EFFECTIVE APPARATUS FOR THE TRANSFUSION OF CITRATED BLOOD*

BY WILLIAM F. MENGERT, M.D., IOWA CITY, IOWA

APPARATUS for the transfusion of citrated blood employing but one container for both receiving and giving blood, is common. Such apparatus has been described by Farr and Gilroy in 1919, by Byford in 1922, and others, and is in use in many clinics. To this type

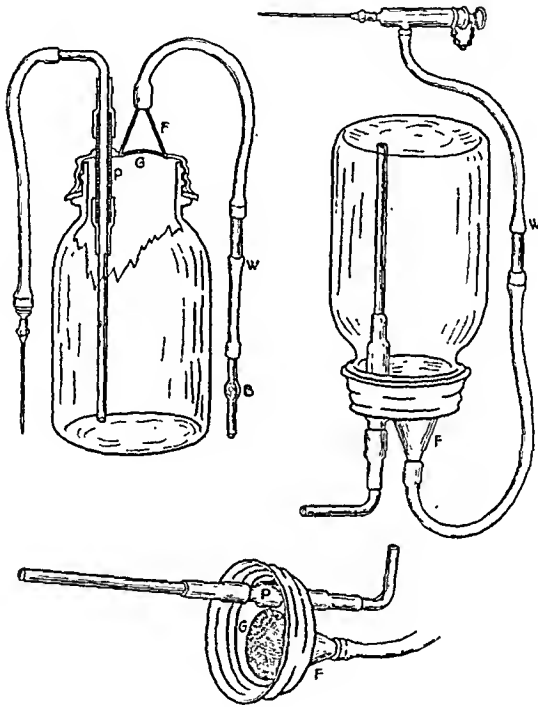


Fig. 1

of device we have added what we believe is a new feature, i.e., a metal sieve soldered in situ, so that the citrated blood may be filtered on its way to the recipient.

The apparatus may be made from a quart mason jar and the top by any tinsmith. A metal funnel (*F*) is soldered into an appropriate hole in the metal jar top after the glass insert has been removed, and into the mouth of the funnel is soldered a fine wire gauze of 40 mesh (*G*). Into another hole cut in the top is soldered a 2 or 3 inch length of metal pipe (*P*) with an inside diameter of $\frac{5}{16}$ inch, or any diameter to fit the glass tubing which is to be used.

*From the Department of Obstetrics and Gynecology. State University of Iowa.

In use, the required amount of citrate solution is drawn into the jar by suction, back flow of saliva being prevented by a glass bulb (*B*) filled with cotton. Blood, in the quantity desired, is withdrawn from the donor in the same way. A Kaufman syringe, or any suitable needle carrier, is substituted at (*W*), the apparatus is inverted, and the blood flows to the recipient by gravity.

This apparatus, in addition to embodying the usual advantages of the indirect, or citrate, method, is compact, simple, inexpensive, easy to clean, and is practically foolproof. There is almost no chance for contamination, because at no time is the blood exposed to the air, and above all the patient is protected by the filter from the chance clot which occurs occasionally, even when citrate is used.

We have been using this apparatus for the past six months with excellent results in the Department of Obstetrics and Gynecology of the University Hospital, and can vouch for its efficiency.

Bodin, E.: Fulminating Gangrene of the External Generative Organs of the Female. *Presse méd.* 36: 1611, 1928.

This is a very rare condition, and the author could find in the French dermatologic literature only 4 cases similar to the one described by him. Of these 4, 3 patients died. In the case here reported, the gangrenous area involved the lower two-thirds of the vulva, extending to within 5 cm. of the anus, while laterally it extended on to the internal surfaces of the thighs and the buttocks. The lesion presented the typical characteristics of gangrene, and was limited by a definite zone of demarcation. The general condition was very poor.

The treatment consisted of local applications of oxygenated water and of a 1:2000 solution of potassium permanganate, together with tonics and supportive treatment. The patient improved, and the eschar separated on the ninth day. The lesion was now dressed with an ointment containing balsam of Peru and iodoform. Some spots were touched with 5 per cent silver nitrate. Cicatrization progressed satisfactorily, and the area was finally covered by epithelium. There was very little deformity or contraction.

The lesion appears, according to the literature, to be consequent upon an accidental inoculation with several necrosant anaerobes. In the author's case, many organisms were found, but there was a predominance of fusiform bacilli and of spirilli of the fusospirillary symbiosis, to which Sanarelli has given the name of "Héliconème Vincenti." In the cultures were also found cocci and many chains of streptococci. The inoculation had apparently taken place during the last sexual intercourse, eight days before the patient came for treatment.

The author recommends addition of the antigangrenous serum of the Pasteur Institute to the treatment outlined above.

E. L. KING.

Society Transactions

PHILADELPHIA OBSTETRICAL SOCIETY

STATED MEETING, MAY 2, 1929

DR. PHILIP F. WILLIAMS described a case of **Diaphragmatic Hernia as a Cause of Stillbirth.**

A colored secundi-gravida, seven months' pregnant, was admitted to the obstetric service at the Jewish Hospital, April, 4, 1929, in labor. A spontaneous delivery followed. The child was stillborn, all efforts at resuscitation proved ineffectual. The maternal blood Wassermann was negative.

Autopsy Report: The body was that of a colored female child, approximately seven months prenatal in age. The entire body was cyanotic in appearance. There were no gross external abnormalities.

On opening the peritoneal sac bloody fluid exuded, and it was found that the abdominal cavity was free of viscera except for the colon and the left lobe of the liver. Traction on the colon revealed that the stomach and small intestines were contained in the left chest cavity above the diaphragm. Examination of the diaphragm revealed a failure of fusion to the posterior abdominal wall, or a congenital absence of a portion of the diaphragm, resulting in an opening between the anterior portion of the diaphragm and the posterior abdominal wall. A similar incomplete diaphragm was found on the right side permitting the right lobe of the liver and the gall bladder to rest in the right chest cavity.

Examination of the chest cavity disclosed both lungs to be about one-fourth normal size, and atelectatic.

The thymus was not enlarged. The heart, liver, kidneys, and pelvic viscera were normally developed.

DR. FRANK B. BLOCK read a paper entitled **Massive Ovarian Hemorrhage.** (For original article, see page 102.)

DISCUSSION

DR. E. A. SCHUMANN.—I have had the privilege of studying a series of cases. These hemorrhages may be of three origins: First, and I believe the commonest, from a misplaced area of endometrium, as pointed out by Sampson; second, from follicles as in Block's case; and third, from corpus luteum.

From a study of the literature it would appear that those resulting from the corpus luteum are probably the most severe and the cause of the greatest blood loss.

The follicular type occurs most frequently in virgins, although endometriosis may occur in these young women, and is a rather prolific source of hemorrhage.

I agree with Block that conservatism should be the rule in treatment. However, one should determine macroscopically whether hemorrhage is follicular or due to endometriosis. If the latter, then extensive resection or even removal of the ovary is the best safeguard against the development of the adhesive chocolate cyst which follows endometriosis. Some years ago I had the privilege of making a study of a series of cases with Dr. Herbert Fox, and we found distinct arterial lesions in every case studied.

DR. GEORGE W. OUTERBRIDGE.—I have never seen one of these cases and do not believe that they are exceedingly common. I have never been able to understand why such extensive hemorrhage should follow a small rupture in the ovary and in this connection what Dr. Schumann said about endarteritis is of importance. It has always been considered in extensive hemorrhage from a small rupture in tubal pregnancy, that the bleeding was kept up by some hormone which hindered the coagulation of blood as it came out through the tube. Our teaching has been that if pregnancy is not present, you would not get such extensive hemorrhage. In virgins there is no such element present, and I am wondering if this does not throw some doubt on the theory. I think it would be interesting to have a study made of the coagulation time and see if there is any blood dyscrasia, such as Dr. Block thought was a factor in this case. I think the presentation is important also because it reminds us that there are other causes than ectopic pregnancy for some of these hemorrhages of gynecologic origin.

Of course there are still other causes for acute massive peritoneal hemorrhage than tubal pregnancy, which we see occasionally. Fifteen years ago I showed before this Society a specimen of a chorionepithelioma which had perforated the uterine wall, with no external bleeding. The patient had all the symptoms of ectopic pregnancy and such a diagnosis was made. At operation the abdomen was full of blood, but the tubes were normal and further examination showed a small rupture of the chorionepithelioma through the fundus of the uterus as the cause of the hemorrhage.

DR. JAMES T. PRIESTLEY AND DR. FRANKLIN L. PAYNE presented a paper entitled **The Treatment of Pelvic Inflammatory Disease. A Report of 278 Cases Treated Surgically.** (For original article, see page 87.)

DISCUSSION

DR. E. A. SCHUMANN.—I regret that Dr. Payne did not go into the subject of leucorrhoea following conservative operations for infectious uterine conditions, because this symptom has been the most troublesome one we have met with after conservative operation in which a possibly infected fundus has been left in situ.

As to the treatment of severe purulent conditions by conservative methods, diathermy, etc., I grow more skeptical as I get older because of the continual cropping up of patients discharged from my services in various hospitals, two and three years later being operated upon in some other clinic; and I have come to believe that a number of patients we lose sight of do not recover from the original symptoms and having recurrence of the pain, etc., go to other clinics.

DR. J. MC GLINN.—As far as conservative treatment in pelvic inflammatory disease is concerned, there is no question but that it is the proper procedure. Surgery has no place in acute infection except possibly to relieve abscesses. I believe that very few cases of definitely sacculated pus tubes entirely recover; there is no doubt that a great majority of the cases of so-called frozen pelvis with infection in the parametrial tissues do recover, no matter what the treatment; but with definite sacculated pus tubes, the symptoms may improve but the definite pathology is left. These are the type in which, while we are waiting for the patient to recover more fully, we find that they still had symptoms and go to other clinics for operation.

I have charge of the Venereal Clinic in Blockley and have been able to observe the results of operations for inflammatory disease in Negroes. Our usual procedure with them is to cauterize the cervix before opening it, and then making a clean sweep of the pelvis afterward. This is a very radical procedure, but we have found that if conservative measures are employed, a great many of them

come back. Just why this should be in the colored race, I do not know. Dr. C. J. Miller several years ago in a paper pointed out this same observation from his experience at the Charity Hospital in New Orleans. His experience and my own have led me to believe that in the colored race, it is better to forego conservative treatment and practice radical surgery when we do operate.

DR. BLOCK.—I would like to ask whether in this series, Dr. Payne had any cases in which ovarian grafting was done and if so will he tell us the end-results.

DR. LEWIS SCHEFFEY.—Some months ago I reported a series of cases of inflammatory disease in which expectant treatment with both diathermy and other methods showed no material difference. We also used the hot douche and foreign proteins. Although the statistics seemed to show no great difference, I thought that diathermy was the better agent in preparing these patients for operation in the properly selected cases. Our results at the Jefferson have been in line with those shown.

DR. PRIESTLEY.—In answer to Dr. Block's question concerning the cases in which ovarian grafts were employed, Dr. Priestley stated that the patients which were treated at the University Hospital fall into two classes:

First, those in which the uterus, tubes, and ovaries were removed and grafts of the ovary placed in the rectus muscle, and second, cases in which the uterus was conserved after the removal of the adnexa and ovarian tissue graft performed. Unfortunately I do not have the statistics at hand concerning these cases, but I can reply in a general way: In Group 1, in which the fundus was removed and an ovarian tissue-graft performed, the menopausal symptoms were slightly less frequent and apparently less severe than in the cases in which no grafting was done. In Group 2, nine in number in which the fundus of the uterus was grossly healthy and was conserved, with ovarian graft after removal of both tubes and ovaries, we were surprised to find that in all of these, menstruation returned in six months. About 40 per cent of these patients had menopausal symptoms beginning four to six weeks after operation and disappearing just before menstruation reappeared. The characteristics of the reestablishment of menstruation were that its return was usually profuse and lasted for from three to six weeks at the first period, after this the flow moderated and became regular. One case out of the nine had profuse menstruation which was controlled by x-ray to the graft site in the rectus muscle. In the entire series of about 30 cases, none of the grafts gave any trouble. Two stitch abscesses were the only wound complications.

DR. C. C. NORRIS.—I have treated a number of the patients in this series. It is really such careful follow-up statistics as these that are valuable and are especially desirable in this class of cases. It is only by a study of the end-results that we can select the proper treatment. I did not know that as high a proportion of patients were relieved from pain as is apparently the case. It is a difficult thing to form accurate grouping of results following operation, and it is particularly difficult in the case of pelvic inflammatory disease. Here we have young women with a disease of the genital tract which we know can be cured in the majority of instances by a radical operation, but the question is, if by such methods we do not often leave them worse off than before operation. My own feeling regarding conservative operation is, that if an ovary is left, which results in prolonged painful symptoms, the woman is apt to be generally more nervous than if the ovary was removed. On the other hand, if an ovary can be conserved with moderate safety, the likelihood of a comfortable happy patient is greatly enhanced. Another point which Dr. Payne has brought out, and which was emphasized by Aldrich in his splendid study of 1,080 cases from the Woman's Hospital in New York, is, that nature will care for a great many of these infections.

Concerning the theory of reinfection in the case of gonorrhoea, my understanding of Curtis' work, and my own observation is, that this does not necessarily mean a new infection, but an exacerbation of the pelvic inflammatory disease resulting from reascension from the infected cervix. Gonococci can generally be demonstrated in the cervix during all stages of the disease. Dr. Payne found that 2 per cent of the patients had pain following the radical, and 5 per cent following the conservative type of operation. This does not take into consideration the discomforts incident to the surgical menopause which occur in the patients submitted to the radical operation, and, I believe, were we able to carefully question each patient in this series, we would find that on the whole, the women upon whom the conservative type of operation had been performed, were the better off. Careful study of the literature of this subject shows that (a) operation during the acute stage has been practically abandoned, and (b) that when operation is resorted to it is more likely to be too early than too late.

To secure the best results each patient's case must be studied individually, and end-result studies must be frequently made. One point I should like to stress is that when gonococcal cases are treated by conservative surgery, especially if one tube is spared, subsequent treatment should include care of the cervix as well as cauterization of the latter at the time of operation. To discharge such a patient who harbors gonococci in the cervix is to court further trouble. Indeed, the condition of the cervix is an important point, not only in the postoperative prognosis, but should be, to an extent at least, a guide as to the type of treatment to be employed.

Colored women do not, as a rule, suffer from as severe surgical menopausal symptoms as do the white, and are for many reasons more likely to be reinfected. For these reasons, a somewhat less degree of conservatism is advisable in regard to the type of operation in the case of the colored women than in the case of white.

DR. PAYNE (closing).—Answering Dr. McGlenn's criticism that the statistics seemed hardly fair as concerned relief from symptoms by radical operation and by conservative measures, I will call attention again to the results as tabulated (Fig. 1).

DR. CLIFFORD B. LULL presented a **Report of Four Cases of Unusual Congenital Defects.** (For original article, see page 106.) This was discussed by Dr. R. M. Tyson.

The American Journal of Obstetrics and Gynecology

GEORGE W. KOSMAK, M.D., EDITOR

HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Editorial Comments

An Association of Women's Hospitals

IN STRANGE contrast with older civilized countries, the hospitals in the United States devoted to the treatment of conditions peculiar to women, show a curious lack of uniformity in practice and a lack of unanimity of opinion as to the scope and character of their work. In one hospital nothing is attempted except the care of women in actual childbirth. There is no provision for the treatment of the complications of pregnancy and the complications and consequences of delivery. These conditions must be referred elsewhere, although their management is an essential part of the duty of those who assume the responsibility of managing the process of labor. In another hospital there is provision only for dealing with the diseases of women, five-sixths of which are the consequences of child-bearing and none of which can be adequately dealt with except by a hospital staff familiar with that process. There are all gradations between these extremes.

Fortunately this provincial indifference to the practice of the civilized world is beginning to disappear. There are now on this continent several women's hospitals where all the conditions peculiar to the sex are studied in close correlation. This is really the only way to assure progress in this branch of medical science and practice, and the only way to keep pace with the advance of gynecology. It would appear that the time has come to hasten this movement. There are still too many hospitals of the old type here which retard progress. There is an opportunity now to standardize these institutions in accordance with the principles generally accepted throughout the world, in some such manner as has accomplished so much for the betterment of the general hospitals in the country. Whether this standardization can best be accomplished by such agencies as the American Medical Association,

NOTE.—In response to requests from various sources, the Editors of the Journal are inaugurating in the present issue a department of Editorial Comment, which we trust will meet with the approbation of our readers. Where not signed, the "comments" are by the Editors.

the American College of Surgeons or the individual state boards of licensure is open to question. A suitable preference would be an Association of Women's Hospitals organized by a group of the most modern and best equipped of these institutions. Such an association by example, in the scope and character of its work, by precept and by a certain amount of compulsion through rating and requirements for admission to the Association, could rapidly raise the general level of the hospitals in America devoted to the care of women, so that they might stand comparison with such institutions elsewhere.

—*Barton Cooke Hirst.*

The Unity of Obstetrics and Gynecology

OBSTETRICS as an art has been practiced from a time when a woman felt herself unable to cope with childbirth and asked the assistance of neighbor or friend to help her out of her difficulty. Gradually, with the growth of what we recognize as civilization, certain persons in the community assumed this burden and carried it on to the best of their limited knowledge and ability. But even after the advent of the physician, obstetrics was long practiced by a class of women, usually self-trained, who practiced their art unrestrained. Their function still persists in the midwife, maligned as she has often been, and yet even at the present day regarded in many countries as an essential factor in the conduct of this particular branch of medicine. Obstetrics, however, is no longer an art, it has also become a science, and is now an essential part of that somewhat limited field in which the diseases peculiar to women have been included. And quite naturally, because this particular group of complaints and illnesses depends so largely on childbearing, that important physiologic function which constitutes the great essential of a woman's life. The accidents of childbirth which left their mark, in time called for methods of repair but, compared with obstetrics, it is less than a century since gynecology has been developed as a specialty. And it should be noted that our own country has occupied an initial and important part in the matter, for modern gynecology may be said to have developed as the result of the labors of Marion Sims, Ephraim McDowell, and others.

The close union between obstetrics and gynecology was recognized abroad before it met with favor in this country. In Germany, in particular, the Frauen Klinik included in its field of activity both the care of the pregnant woman and the repair of the resultant wounds of childbirth as well as the treatment of other pathologic lesions of the female pelvic organs. A unity of thought and teaching thus developed which has contributed much to the advances in both of these branches of medicine. In the course of time America followed the lead of Europe and many of our leading institutions of learning and their at-

tached hospitals, as well as others, organized combined services in obstetrics and gynecology.

Obstetrics has often been spoken of as a surgical specialty. This is an error. While a surgical conscience should govern the obstetric attendant, the ordinary conception of surgery as an operative procedure is far from a safe basis for obstetric practice. Among other things, a knowledge of general medicine is most essential to the equipment of a good obstetrician. Gynecology likewise is far removed at the present time from the field of purely surgical treatment. Attention need merely be called to the many agencies and therapeutic resources which have been called into play in formulating gynecologic practice. Radium, the x-rays, endocrinology, physiotherapy, psychotherapy and other therapeutic resources in addition to purely surgical procedures have been drawn upon in combating what are popularly denominated as the diseases of women. However, there are still many hospitals in which the department of gynecology is administered by the general surgeons and in which treatment is practically limited to operative procedures to the utter neglect of those advanced methods of treatment which do not come within the domain of the general surgeon. A critical analysis of the results of gynecologic practice in such hospitals would constitute an interesting text for a sermon were some one found courageous enough to undertake the task and announce the results of such comparative observations. Efforts have been recently made in certain groups of municipally controlled institutions in one of our largest cities to make gynecologic departments subsidiary and under the direction of the attending surgeons with the gradual elimination, as a result, of the gynecologist per se. An extension of this policy would be most unfortunate. It would relegate gynecology to a more or less mechanical procedure, which is far from the modern conception of this branch of medicine. Moreover it would signally interfere with the training of medical students and physicians in which unity of thought and action has been sought as an antidote to that schism between gynecology and obstetrics which at times has threatened progress in this very important branch of medicine.

Career or Maternity?

WORLDLY success and motherhood have been deemed incompatible by certain writers and equally defended by others. Meanwhile the attendance at colleges for young women in the United States has outgrown the facilities, and the marriage problems of their graduates occupy increasing attention. That a college education will serve as a basis for the propagation of high intellectual or physical standards is questionable, particularly if we accept the late or low marriage rate and the admittedly low fertility of this group. Lay writers appar-

ently have studied the subject more fully than physicians, and a recent article by Henry R. Carey in the *North American Review* for December is worthy of attention. The sociologic aspects of this question may better perhaps be discoursed upon by others, but medical men and obstetricians in particular should manifest an interest in the biologic phases of the problem. This relates particularly to late marriages, delayed pregnancies, and low fertility, with their consequences. There need be no lack of intellectual women in this world, but a part at least of their education should be centered in preparation for the greatest function in their lives. This our girls' colleges have apparently failed to do, according to Mr. Carey, who quotes in support the presidents and deans of certain leading American institutions. "An invitation to celibacy" he designates the substance of their subtle gospel of advice to the young women in their charge. He believes, furthermore, that the influence of the older feminists in college faculties on the student body probably creates a false atmosphere of distrust and dissatisfaction which many find it difficult to overcome in later life when the falsity of this point of view becomes evident to them. And in line with this the false doctrine of trial marriages and birth control might profitably be demonstrated to our youth. "In a country crying aloud for intelligent organized leadership by the mentally and morally fit, the stock of the most capable must not be allowed to die out." The physician can extend very valuable aid in the solution of these problems. With his knowledge of the immutability of biologic law it is his duty to acquaint himself with the facts and to use his influence toward the development of a newer feminism from which these false conceptions of woman's position in the world are eliminated.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review of New Books

BY ROBERT T. FRANK, M.D., NEW YORK CITY

THE semiyearly publication of these book reviews has now been kept up for several years. It was undertaken with the expectation of supplying to the readers of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY an unbiased view of some part of the world's literature seen through the eyes of a clinician whose interest was largely concentrated on the practical problems of the gynecologist and obstetrician, but whose laboratory opportunities enabled him to judge with sympathy and, I hope, with some degree of understanding, the many researches which are under way at present.

A serious difficulty has, however, been found in this type of review, in that the infrequency of its appearance is regarded by both authors and publishers as a drawback and an injustice. For example, a book received immediately after this present review has been completed, would under the present system, not appear in the files of our journal until at the earliest in June or July, 1930. Moreover, I have found a number of these books so specialized that they require reading and criticism from specialists, psychoanalysts, neurologists, pediatricians, chemists, biologists, etc.

Therefore, at my request, the editors of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY have consented to my essaying a new type of review in which books will be given immediate consideration and the reviews will appear at monthly or bimonthly intervals. Many of these reviews will be allotted to physicians who are specializing in a particular field. I hope to be able to continue to read the books on gynecology and endocrinology in person. As heretofore, every review appearing in this journal will be signed by the person responsible for it. Nothing, in my opinion, more readily leads to undeserved and fulsome praise on the one hand, or to equally undeserved, sharp and derogatory criticism on the other hand, than anonymity in reviews.

GYNECOLOGY

Fulkerson's¹ work is a volume of more than 800 pages which shows earnest effort. It has succumbed to the lure which so many modern gynecologists display in that really extraneous subjects such as anesthesia, transfusion, kidney and rectal diseases occupy a perhaps undue portion of the text. To the diseases of the female genital and associated tracts, 453 pages have been devoted. Forty-two pages are allotted

¹Gynecology. A Textbook of the Diseases of Women. By L. L. Fulkerson. P. Blakiston's Son & Co., Philadelphia.

to medical treatments, anesthesia, radium, transfusion, etc.; while 311 pages are occupied by operations. Not less than 187 pages in these various subdivisions are taken up by the discussion of the urinary tract and rectum.

The chapter on anatomy is sound and clear, with illustrations from classical sources such as Savage, Kelly, Deaver, Morris, etc., to whom due credit is given. The chapter on malformations is by Christensen. Dr. Campbell deals with the subject of spinal and sacral anesthesia as well as blood transfusion.

The chapter on endocrines is extremely unsatisfactory, including such statements as that found on page 85, for example, "The hormone function of the mammary gland is clearly to antagonize the ovary in both its ovulating and menstruating activities." The author's faith in organotherapy is touching as, for instance, the use of dried mammary gland and dried placenta. In speaking of the hormones of the corpus luteum, he adopts certain trade names.

On the whole the author's outlook in the treatment of inflammatory disease is distinctly conservative and well taken. Just why he places sterility under diseases of the fallopian tubes, I cannot understand, as this unduly emphasizes and accentuates one phase of sterility which is already today receiving undue attention. Quite an elaborate chapter on the use of iodized oil in salpingography has been included.

The division of the book dealing with operations is long. The author is inclined to describe "technics" with the names of operators attached who evidently he has watched, rather than with the names of those who chronologically or bibliographically are entitled to this distinction. Although on the whole I am inclined to prefer and favor line drawings because of their comparative inexpensiveness and their illustrative value, the illustrations have not proved successful, the result often being unclear both in original drawings and in those copied from other sources. It is always difficult to reproduce by a line drawing pictures from sources in which the original was by the half-tone process. In many instances one phase of an operation is illustrated by a drawing which is in the vertical position, the next drawing of the same operation being set up in a horizontal fashion. This is disturbing and confusing.

Each chapter is furnished with a short bibliography.

In *Gonorrhoea and Kindred Affections*² Livermore deals with the male, Schumann with gonorrhoea in the female. About an equal amount of space is devoted to each.

Schumann finds that the internal os is passed in about 50 per cent, which agrees fully with my own observations. He discusses all the complications including salpingitis and arthritis.

In the male portion of the volume chancroid and venereal warts are dealt with, while granuloma inguinale is discussed by Schumann. This monograph is well got up, is short, and should prove valuable to the practitioner.

The 1925-1928 report of the Scientific Work of the Surgical Staff of the Woman's Hospital in the State of New York³ contains forty con-

²*Gonorrhoea and Kindred Affections*. By G. R. Livermore and E. A. Schumann. D. Appleton & Co., New York, 1929.

³*A Report on the Scientific Work of the Surgical Staff of the Woman's Hospital in the State of New York, 1925-1928*. Edited by G. G. Ward.

tributions by the members of the staff and ten theses by Cornell students. Papers on radium effect in carcinoma of the cervix appear by Farrar and Ward. Numerous phases of prolapse have been dealt with by Goff, Hurd, and Bullard. Various papers on obstetric, urologic and pathologic subjects are included. Among these latter a rare case of diffuse adenosis of the vagina is contributed by Plaut. A thesis by Hatz and Neuman on the evaluation of salpingostomy reports success in nearly 10 per cent, which is far above the figures to be gathered from the world's literature. With the exception of the theses, practically all of these papers have appeared in various medical publications.

Vignes⁴ has written this large and astoundingly encyclopedic volume as a continuation of the first volume which dealt with the physiology, both normal and pathologic, of pregnancy. The present volume is concerned with a similar discussion of the physiology of the nonpregnant woman. He traces the causes as well as the evolution of those sexual phenomena recognized from fetal age to senility with an amazing fullness of detail and grasp of minutiae which is staggering.

Such tangible things as the endocrine system at puberty and such intangible things as the changes of the psychology at puberty are discussed. One hundred eighteen pages are devoted to the subject before adult life is reached.

Both laboratory experimental investigations and clinical facts are correlated in each paragraph and chapter. For example, the vaginal cycle in the human being as pictured by Dierks is described and illustrated. The menopause and its troubles are not neglected. In great detail a study and evaluation of the various organ extracts and their effects are presented. He is very doubtful and sceptical about the value of all ootherapy to date. The author likewise discusses the ovarian graft, the antimasculine effect of the female sex hormone, and its effect on the breasts.

This work is a stupendous effort, requiring patience, research, and a correlating faculty which is unusual. The huge bibliography alone is of utmost value to anyone interested in gynecology, and is easily accessible by means of the excellent index.

The fourth volume of the *Lehrbuch der Strahlentherapie*⁵ appears in two installments, the entire 1394 pages dealing with radiotherapy in gynecology. This represents a very valuable contribution to the gynecologic literature of the world. The work was begun before the war, lay fallow during this entire period, and has now been brought up to date. It is an encyclopedic book of reference for both the gynecologist and radiotherapist. It is possible for me only to discuss the high spots of this tremendous book.

Schmitt deals with the biologic basis of gynecologic radiotherapy. He emphasizes the rapid effect on the ovarian follicle which requires only a few hours to be noticed. He agrees with other investigators that there is no "Reizwirkung," and that effects are produced by an increased destruction of follicle cells.

Wintz and Rump describe the physics and technic of roentgen ef-

⁴Physiologie Gynecologique et Medecine des Femmes. By H. Vignes. Masson et Cie, Paris, 1929.

⁵Lehrbuch der Strahlentherapie. Band IV. 1 Teil. 2 Teil. Die Strahlentherapie in der Gynecologie. Edited by von Prof. H. Meyer. Urban & Schwarzenberg, Berlin, 1929.

fects on the ovaries for castration and the larger doses used for treatment of carcinoma. Neef does the same for radium.

Gauss describes the roentgen treatment of myomata and of hemorrhagic metropathies, while Kupferberg shows the effects produced by radium in these same diseases. The radiotherapeutic treatment of genital tuberculosis has been assigned to Eymmer. Vogt has assembled the rare uses for roentgen therapy, including such diverse conditions as amenorrhea, dysmenorrhea, treatment of castration symptoms, induction of abortion, sterilization, the effects on the endocrine system, and upon inflammation, to indicate only a few.

The second installment deals with the treatment of malignant genital tumors. Seitz gives a very concentrated presentation of the subject as a whole. He agrees that undifferentiated carcinomata are very radio-sensitive but that this quality appears to be nullified by their marked tendency to early recurrences. The general systemic reaction to radium must be kept in mind. For this reason he divides the "carcinoma dose" over four days or more. He uses 100 per cent H E D, calculated upon the location of the carcinoma. If he gives 2000 to 3000 milligram hours of radium, the x-ray is reduced to 70 to 80 per cent H E D.

He fully describes the Seitz-Wintz technic (six fields of entry used), as well as the Dessauer-Warnekos technic, in which only four fields are employed, with the former a 23 cm. focus, the latter with a focus of 40 to 60 cm. Judged by the reports in the literature, an equal percentage of cervical carcinoma of the operable groups are saved by operation and radium plus roentgen treatment, but with these must be considered the 10 to 15 per cent of inoperable cases which are solely amenable to radium therapy.

v. Seuffert discusses radium in gynecology, its dosage, concentration and technic. Warnekros describes postoperative radiation. Wintz deals with the radiation of breast cancer. To Flaskamp is assigned the damages produced by radiotherapy. Guthman describes light therapy and Lindemann diathermy in gynecology.

Both an authors' and a subject index accompany this most important volume, making it immediately and easily accessible.

The first half of the fifth volume of Stoeckel's *Handbuch der Gynäkologie* (3rd revised and enlarged edition of J. Veit)⁶ consists of a huge volume totaling 1041 pages which, unbound, costs \$27.60.

This contribution contains two articles of different length, the first that by Erwin Kehrer on the vulva and its diseases, covering 697 pages with 288 illustrations, many of which are in colors. The second portion is by Rud. Th. v. Jaschke on the malpositions of the female genital apparatus.

Kehrer has taken up the diseases of the vulva in the utmost detail, giving a clear-cut, well-written presentation. Of particular interest is the embryologic development and the congenital anomalies of the vulva. Injuries are described in full. A surprising amount of information on the dermatologic lesions of the vulva, including the venereal infections, is given. The illustrations are at times almost too numerous, but are of exceptionally good quality. On the whole, one is surprised

⁶*Handbuch der Gynäkologie*. Edited by W. Stoeckel. Fünfter Band. Erste Hälfte. Die Vulva und ihre Erkrankungen. Lage und Bewegungsanomalien des weiblichen Genitalapparates. By E. Kehrer and R. T. v. Jaschke. J. F. Bergmann, München, 1929.

how little the histology of vulvar lesions is taken up. Another lack is that of illustrations to clarify the radical operation for vulvectomy, of which the author gives his own modification. The citations of the world literature are voluminous, well arranged, but neither very detailed nor complete. On the whole this contribution is of exceptionally high quality and importance.

v. Jaschke deals in greatest detail with the dynamics of the pelvis. He has found no connection between retrodeviations and menstrual disturbances. In this, most modern gynecologists will agree with him. He emphasizes the importance of constitutional inferiority favoring disturbances of uterine position and injury to the pelvic diaphragm during childbirth. Many operations on the uterine ligaments are described.

Wisely, in my opinion, he has not tried to describe all the published methods. Much of the anatomy and many of the anatomic illustrations are gleaned from the classical *Anatomy* of Halban and Tandler.

The description of operative technic is rather limited for a volume of this size. The relief of cystocele by anterior colporrhaphy, consisting of the reefing of the pubocervical fascia according to what on the continent is described as Martin's technic, is the sole operation given. For the repair of rectocele, a posterior flap-splitting operation with the exposure of the levator fiber with suture in the median line, is advocated and illustrated.

With installment 47, the great undertaking of the *Biology and Pathology of Women*, under the editorship of J. Halban and L. Seitz,⁷ reaches its completion. The first installment appeared in 1923 and this huge undertaking has been finished after six years of constant work, with the help of a large number of collaborators. On the whole, this is the most elaborate monographic series that has ever appeared in gynecology. Like every series, it suffers to a slight degree from the fact, which even a most careful editorial supervision could not entirely eliminate, that different men see their tasks from different points of view and have put a varying amount of effort into their presentations. It is impossible to give a bird's-eye view of these volumes, the reader being referred to the numerous detailed reviews of the installments as they appeared.

Installment 45 of Halban and Seitz's *Biology and Pathology of Women*⁷ contains two articles. The first one by Guggisberg deals with the importance of vitamins for women. It is a most interesting and complete collection of this new subject. He brings out that vitamins are not formed in the body, but are essential for the fetus, and reach the fetus by traversing the placenta. A large number of diseases, the incidence and severity of which are accentuated during pregnancy, are due to avitaminosis. Among the most important are hemeralopia of pregnancy which is due to a want of xerophthalmic keratomalacie vitamine (vitamine A) and is relieved and cured by butter, meat and eggs. Osteomalacia is probably due to lack of vitamine D and curable by cod liver oil and perhaps phosphorus. Tetany results from calcium want. The author uses calcium intravenously to reduce the alkalosis. He does not mention the use of the parathyroid hormone. Dental caries in pregnancy is also due to a disturbance of calcium metabolism.

⁷*Biologie und Pathologie des Weibes*. Edited by J. Halban and L. Seitz. Lieferung 45, 46, 47. Urban & Schwarzenberg, Berlin, 1929.

Beriberi (puerperal kakke) is a lack of vitamine B and must be treated by very large doses of this substance. Scurvy is due to vitamine C deprivation. The subject of the effect of vitamine lack on the newborn, lactation, fertility, in both male and female, and potency are taken up in a thorough and interesting manner.

Zangemeister and Wieloeh discuss intrapartum fever and intrapartum genital infections. In their own material at Königsberg, elevations of temperature during labor were found in 3.7 per cent of all pregnant women serutinized between 1915 and 1927, showing no better statistics than those of previous days in spite of the supposed improvement in asepsis. The possible causes of fever during labor are extragenital intercurrent diseases, eclampsia, muscular effort during labor, and most important, infections of the genital canal. Of the 530 cases of intrapartum fever, 13 per cent could be definitely ascribed to other causes than genital infections.

The second class includes those cases in whom during the course of labor symptoms of pyogenic infection of the genital canal could be demonstrated. The commonest symptoms noted were fever, rapid pulse, putrescence of the amniotic fluid, tympany of the uterus, weak pains, abdominal distention, asphyxia of the fetus. Such symptoms developed in 3.47 per cent of their material. These symptoms appeared especially in protracted labors and early rupture of the membranes.

Puerperal morbidity in these cases is increased tremendously, fever being noted in the puerperium in 50 per cent, maternal mortality is 3 per cent, fetal mortality 35 per cent. The gravity of the condition appears to be proportional to the time of appearance of the fever. The earlier in the labor the fever is noted, the more serious the infection. The pulse rate is of prognostic importance. Multiparae are more seriously affected by this disturbance than primiparae. The finding of hemolytic streptococci in the genital secretion is of grave prognostic importance. On the other hand, a single positive blood culture during the time of labor is of no great significance. Those cases which have entered the clinic after unsuccessful attempts at operative delivery in the home offer the poorest outlook.

The danger of any operative intervention under the given conditions is gravely increased, including such measures usually considered conservative as the introduction of a bag. The fetal mortality after intervention was nearly double that of those allowed to be born spontaneously. In the last 100 cases the authors have become even more conservative in their treatment of intrapartum infection.

Number 46 deals with the influence of spontaneous premature rupture of membranes on labor. Frey has given a paper based on a large number of statistics, which distracts somewhat from the ease of reading. He uses a "contraction" and "pain chart" in which the number and length of the uterine contractions are recorded. A most minute study of 200 primiparae, and 200 multiparae are analyzed and contrasted. For example, in the multiparae the average number of pains in the first stage are 150 with membranes unruptured, in the second stage 50. If the membranes are ruptured, the first stage pains are reduced to 100. What is gained in this is more than lost in the second stage. The morbidity of multiparae is only one-third of that of primiparae.

He concludes that the first stage in both primiparae and multiparae with premature rupture of the membranes is completed with only one-

third of the contractions of those in which rupture of the membranes takes place during the first stage. And yet, even if the child's weight is small, in the second stage the number of contractions is increased over that occurring in the labors without premature rupture of the membrane. Because of this, in spite of the fact that the entire number of labors is less with premature rupture of the membranes, this type of labor is less physiologic than that in which the membranes are not ruptured early. This extensively statistical paper does not lend itself to review. It is adorned with numerous colored and half-tone pictures illustrating particularly the injuries to the child resulting during labor.

Number 47, the concluding installment, contains a few corrections and minor additions but its main bulk is occupied by 67 pages of "contents" which, in my opinion, is largely a waste of effort, and 109 pages of index. As I feared from the beginning of this undertaking the index is not as detailed as the great extent of the work as well as its importance would have warranted. Moreover, there is no authors' index. I strongly suggest to the publishers as well as the authors of this monumental monographic series that in the near future an absolutely complete subject index and authors' index be supplied in order to bring out the full potential value of the work.

This fairly comprehensive monograph on *Leucoplakia and Kraurosis Vulvae*⁸ is worth thorough study. It is based on 36 cases and profusely and well illustrated by means of microphotographs and macrophotographs of the local findings. It is well to remember that this condition was described first by a New York surgeon, Robert Weir, in 1875.

The authors have noted pruritus in every case they encountered, which is rather contrary to the general experience. They advocate prophylactic removal in the "precancerous state." With this radical advice I am in hearty accord as my own personal experience more and more confirms the almost invariable change of this condition into true carcinoma. Casas and Carrauze advocate a radical operation in two stages, beginning with cleaning out of the inguinal glands, followed by vulvectomy. This short monograph is one of the best which has appeared on this subject within recent years.

Heim, from the Clinic of Sellheim in Leipzig, has written a fairly comprehensive monograph on the etiology of endometrioid heterotopies in the mature woman⁹ which deals especially with their etiology and therapy. The theoretic discussion covers the almost exploded wolffian origin introduced by von Recklinghausen, as well as the fetal theories. These may be divided into those dealing with the internal or intra-uterine adenomyosis from the endometrium (Cullen) as well as the adenomyosis externa, explainable according to the seroepithelial theory of Iwanoff, or the metastatic theories of Sampson (through the tubal lumen) and of Halban (metastasis through the lymph vessels).

Of most importance are the experiments performed on several monkeys in order to substantiate or controvert the theoretical conclusions. Transplantation of human endometrium into the Douglas pouch of

⁸Leucoplakie et Kraurosis Vulvaires. By C. Sobre-Casas and Felipe F. Carranza. Masson et Cie, Paris, 1928.

⁹Die Frage nach dem Ursprung der endometrioiden Heterotopien beim geschlechtsreifen Weibe. By Dr. K. Heim. S. Karger, Berlin, 1929.

the female monkey, transplantation of the endometrium of the monkey into its own culdesac, as well as the production of an uteroperitoneal fistula in a monkey, all proved negative.

Mondor's *Les Arthrites Gonococciques*,¹⁰ in contradistinction to most of the French books brought out during the recent years, is unexceptional in format, typography and the illustrations, some of which are in colors. The price, from our point of view is very reasonable. This monograph of over 500 pages costs only 70 francs (less than \$3.00).

Gonorrhoeal arthritis was first recognized in 1781 simultaneously by Swediaur and Selle. Such arthritis may develop even from a primary eye focus as in a case where for pannus, the conjunctiva was infected and in another instance in which the eye of a nurse was infected by pus accidentally splashed from a gonorrhoeal focus. In both instances general joint symptoms developed. The knee is the most frequent site of arthritis. In the newborn, joint symptoms have appeared before the thirtieth day of life, and in small children the incidence is not infrequent. The illustrations contain many good x-ray pictures. Much space is devoted to therapy of which a thorough and unprejudiced description is given, the author not considering any one method a universal panacea. A large bibliography completes this useful volume.

Some of the material appearing in a monograph¹¹ on *Salpingography* has already been recorded in the *Zeitschrift für Geburtshilfe und Gynäkologie*, vol. 94. The material on which the report is based was more than 100 cases in which salpingography by means of lipiodol injection was practiced. Injections are made without the aid of a manometer. Many excellent x-ray photographs, each accompanied by a small marginal explanatory schema, illuminate the text. The author evidently used conservatism and care in selecting the cases in which injection was employed, and therefore has encountered no serious happenings as a result. Both German and world literature are fully dealt with.

As part of the series of *Treatise of Practical Medicine*, Lahm has published this monograph¹² covering the subject of curettage and biopsy for the practicing physician.

To my surprise I see that 10 per cent of the curettages were performed for "purulent endometritis" which strictly contraindicates any intrauterine manipulations. Only 0.9 per cent of the curettages were for carcinoma corpus. The claim that menstruation is due to stasis will hardly be supported by the modern physiologist. The lack of illustrations is keenly felt, in my opinion. Although this monograph is well planned and well written, it far exceeds in length the requirements of the general practitioner.

*The Climacteric or Critical Age*¹³ is a translation of the second edition of Marañón's monograph on this subject. In this translation a number of subjects have been dealt with.

¹⁰*Les Arthrites Gonococciques*. By H. Mondor. Masson et Cie, Paris, 1928.

¹¹*Die Hystero-Salpingographic*. By Dr. N. Temesvary. Ferdinand Enke, Stuttgart, 1928.

¹²*Abrasio und Probeexzision in der Hand des Praktischen Arztes*. By Prof. Dr. Wilhelm Lahm. Theodor Steinkopff, Dresden und Leipzig, 1929.

¹³*The Climacteric (The Critical Age)*. By G. Marañón. Translated by K. S. Stevens. Edited by C. Culbertson. The C. V. Mosby Co., St. Louis, 1929.

The thesis underlying the whole work may be given in the author's words: "The pathogenetic mechanism of climacteric symptomatology is not limited to insufficiency of the genital gland, as has been held, but it is rather the expression of a complex endocrine crisis, which varies in different individuals. In this crisis the outstanding feature is gonadal insufficiency to be sure, but other glandular disturbances occur coincidentally and form an essential part of the crisis."

Upon this pluriglandular hypothesis which he sums up as a "complex endocrine crisis," the entire book rests. With this conception that the menopause is only one, often the central, symptom of the climacteric, we must all agree. The rest of the work, in my opinion, is entirely hypothetical but an extremely clever presentation of the author's theories. He considers hyperthyroidism, hyperadrenalism and overexcitation of the vegetative nervous system among the regular phenomena accompanying the menopause. He is very detailed but highly speculative in his presentation. Many valuable additions to the text have been added by Carey Culbertson who has edited the English translation. For those who are willing to peruse this very clever and interesting book, with the due spirit of reserve, it will be found to contain much stimulating material.

Boeckh¹⁴ has written a short and rather accurate description of *women in their critical years* (the menopause) with its appropriate hygiene and treatment. The subject matter is well presented but inclines somewhat to overdramatization of the symptoms and dangers.

Another book for the laity is that by Paull, *Die Frau*,¹⁵ a guide to general hygiene and health which apparently has met with very kind reception and widespread distribution in Germany. It may be said that it is on a higher level than the usual run of such books designed for the lay reader. The author, being a medical man, is perhaps for that reason conservative and sees the danger of future physical degeneration in woman because of her leaving her sphere and intruding into the work hitherto reserved for men. He considers that this intrusion entails a loss of female qualities both physical and psychical. He emphasizes, probably at the risk of being called mid-Victorian, the effect on woman of her biologic limitations which manifest themselves especially in the field of love "by passivity and suffering."

A few inaccuracies such as that ovulation and menstruation coincide, that the sperma meet with the ovum in the uterus, are after all of minor importance.

A 27 page brochure by Roberts¹⁶ deals with three separate subjects. The first has to do with the operation of colporrhaphy in which very slight variation from the fairly standardized technic is shown. The anterior operation to a considerable degree utilizes the pubocervical fascia. The posterior operation is based on the union of the fully exposed levatores ani.

The second thesis deals with "perineal" trouble and "pelvic neurasthenia" which are considered as visceral manifestations of chronic rheumatism and rheumatic arthritis.

¹⁴Die Kritischen Jahre der Frau. By Dr. Med. G. Boeckh. Strecker und Schröder, Stuttgart, 1923.

¹⁵Die Frau. By Dr. Med. H. Paull. Strecker und Schröder, Stuttgart, 1929.

¹⁶Recent Work on Colporrhaphy, Rheumatism and Coll Bacilluria. By E. H. Roberts. H. K. Lewis & Co., Ltd., London, 1929.

The third emphasizes a causal relationship between preceding rheumatism and *Bacillus coli* infections.

OBSTETRICS

Stander has written a monograph appearing as Volume XV of Medicine Monographs, on *The Toxemias of Pregnancy*.¹⁷ He has classified the conditions to be studied under six heads—vomiting of pregnancy; low reserve kidney; nephritis complicating pregnancy; pre-eclampsia; eclampsia; and acute yellow atrophy of the liver. Of this terminology, only the "low reserve kidney" needs any identification. This, according to the author, is probably identical with the "kidney of pregnancy," with certain types of "recurrent pregnancy toxemia," with the simple "albuminuria of pregnancy" as well as with certain of the "nephroses" of pregnancy.

I wish that the author had put himself more clearly on record in connection with hyperemesis of pregnancy. He has given all the theories without critique, after advocating the treatment of the starvation and dehydration, and then speaks of combating the neurosis which remains. In nephritis he considers the urea concentration test after Rabinowitch the best. He recounts the innumerable hypotheses which are supposed to explain eclampsia, without taking any decided stand in the matter.

Although this is an extremely well-written, clear-cut monograph, it lacks the personal touch to such a degree as to impair its usefulness to some extent.

Kedarnath Das has written a monumental work on the *Obstetric Forceps, Its History and Evolution*.¹⁸ This work consists of 903 pages. It is the first volume of a book which when complete will deal not only with the history and evolution of the instrument but also with its indications, use and abuse, methods of application, dangers (both to the mother and the child), its value as compared with any other feasible operation, its medicolegal aspects, and statistics. Over 2000 references in all languages have been collected and included in the present volume.

The book is divided into several periods, first, the pre-Chamberlen period, next the Chamberlen period, then forceps in Holland, after that the eighteenth century forceps, and finally in periods covering twenty-five and fifty years, forceps to the year 1928. In addition, forceps in allegory, literature and art are taken up. In the book he incorporates the text of some of the very rare volumes especially those difficult to obtain, such as Mulder, Killian, and Aveling. The work is profusely illustrated showing all types of forceps, contains many tables and appendices, not to speak of the huge amount of carefully verified literature.

Cases of *encephalitis lethargica* are reported with increasing frequency in the literature. It thus follows inevitably that they are more often observed in association with pregnancy. Roques¹⁹ has rendered

¹⁷*The Toxemias of Pregnancy*. By H. J. Stander. Williams & Wilkins Co., Baltimore, 1929.

¹⁸*Obstetric Forceps. Its History and Evolution*. By Kedarnath Das. The Art Press, Calcutta, 1929.

¹⁹*Epidemic Encephalitis with Pregnancy, Labour and the Puerperium*. By Frederick Roques. Obstetric and Gynecologic Registrar, Middlesex Hospital, etc. Sherratt & Hughes, Manchester, 1928.

a great service to the obstetrician in presenting this monograph, which deals comprehensively with pregnancy, labor and the puerperium complicated by encephalitis. His study is based on 171 already reported and another 40, heretofore unpublished instances of this serious complication of pregnancy and also includes analysis of 23 cases in which pregnancy was associated with the Parkinsonian syndrome. Among the final conclusions may be noted the following: Epidemic encephalitis must be treated as such, apart from the complicating factor of pregnancy. Interruption of gestation is not to be advised. Conservative treatment has yielded satisfactory results. The mother should not be permitted to nurse. There seems some possibility of infection of the fetus in utero.

As already indicated, this little volume offers to the obstetrician interesting and valuable information on a timely problem.

H. EHRENFEST.

This monograph,²⁰ liberally illustrated with charts, deals with the *prenatal conditions* in southern India. It is a statistical study dealing with various aspects of obstetrics such as the effect of early and late marriage, forceps and other inventions, the effect of syphilis on the fetus and newborn, etc.

In the introduction to this book of Metzger,²¹ Paul Bar says, "And still another compend of obstetrics" and then proceeds to show why this compend differs from its predecessors. The author insists that obstetrics has become simplified and also more surgical. He advocates sterilization of the perineal region and vulva with double strength iodine. Vaginal examination is taught with the finger protected merely with a double finger-cot type or incomplete glove. No mention of rectal examinations is made throughout the book. Most of the text illustrations are unduly diagrammatic and of poor artistic merit. On the other hand, this book contains much information in condensed form, particularly about pathologic deviations in pregnancy and the puerperium. It is especially good on intercurrent diseases and some of the rarer medical complications of pregnancy.

The second medical report of the Glasgow Royal Maternity and Women's Hospital²² covering the year 1927 has appeared. The material deals with the 7,700 patients treated. Twenty-one per cent of the beds of this institution were used for antenatal care, the entire capacity of the hospital being 114. The contents of the report is published in the form of statistical tables.

Almost simultaneously Carolyn C. Van Blarcom has brought out a second edition of two of her publications. The first of these is a volume on *Obstetrical Nursing*²³ which has enjoyed a wide distribution.

²⁰The Causes of Ante-Natal, Natal and Neo-Natal Mortality in Infants. By A. Lakshmanaswami Mudaliar. Associated Printers, Madras, 1929.

²¹L'Accoucheur Moderne. Précis D'Obstetrique. By A. Metzger. Librairie Félix Alcan, Paris, 1928.

²²Medical Report for the Year 1927. Glasgow Royal Maternity and Women's Hospital. Prepared by J. N. Cruickshank. William Hodge & Co., Glasgow and Edinburgh, 1928.

²³Obstetrical Nursing. By C. C. Van Blarcom. Second Edition, Revised. The Macmillan Co., New York, 1928.

The second edition emphasizes particularly the social and community aspects of obstetrics and obstetric nursing. The author emphasizes the fact that since 1920 the maternal death rate per 100,000 has risen from 13.4 to 15.6 in the United States.

The second edition of her concise little manual on *Getting Ready to be a Mother*²⁴ has been brought up to date in various ways.

Dennett has added another manual²⁵ for the laity on the subject of the *healthy baby* which after all is always with us. It is a new edition of his book in which he incorporates the treatment of rickets by heliotherapy and cod liver oil. The manual is short, fairly precise and has a marginal index.

In contradistinction of the usual baby book which pleased relatives habitually shower upon the expectant mother, the *Modern Baby Book and Child Development Record*²⁶ from birth to sixteen years is an effort to make such a gift both useful and permanent. The authors are respectively the director and associate professor of the Institute of Child Welfare at the University of Minnesota. They have tried to incorporate a large amount of useful information in the form of an introduction and interpolation between sections. This has been done without interfering with the usual space allotted to the proud mother who will find opportunity to record her ancestors, legal documents such as birth certificates, photographs, teething records, etc., etc., in the blank spaces left. Many useful charts add to the value of this contribution.

EUGENICS

Whatever the "Human Betterment Foundation" may be, this monograph²⁷ published from this source gives a very fair and uncolored account of the situation. The material is based on a summary of results of 6,000 operations performed in California between 1909 and 1929. Both the average medical as well as lay reader will be surprised to realize the tremendous number of defectives requiring care and treatment throughout the United States. According to the authors, 10,000,000 definitely mentally inferior beings exist in the United States, of which a large number, however, pass through life as fairly useful citizens. They form not only an economic problem because of the huge sums of money necessary for their maintenance and care, but also a eugenic problem because of their propagation of other defectives. In the words of the authors, "Eugenic sterilization of the hereditary defective is a protection, not a penalty, and should never be made a part of any penal statute. The United States Supreme Court has recently sustained the legality of eugenic sterilization. In the case of *Buck vs. Bell*, where a feeble-minded woman who had a feeble-minded mother and a feeble-minded child was to be sterilized against her will, Justice Holmes, in handing down the decision, said, 'Three generations of im-

²⁴*Getting Ready to be a Mother.* By C. C. Van Blarcom. Second Edition, Revised. The Macmillan Co., New York, 1929.

²⁵*The Healthy Baby.* By R. H. Dennett. The Macmillan Co., New York, 1929.

²⁶*The Modern Baby Book and Child Development Record.* By J. E. Anderson and F. L. Goodenough. W. W. Norton & Co., New York.

²⁷*Sterilization for Human Betterment.* By E. S. Gosney and Paul Popenoe. The Macmillan Co., New York, 1929.

beciles are enough.' " True to his usual form, the oldest justice of the supreme court has taken the most modern and enlightened view.

Of 6,255 sterilizations, 601 more males than females were sterilized in the state of California, of the feeble-minded all are now sterilized, of the insane, about 1 in 5 or 6. In this entire number, failure of the operative intervention occurred in 3 males and 4 females. In males vasectomy is performed, in females ligation of the tubes or a combination of ligation and section of the tubes. In the large number of cases operated upon, 4 deaths occurred, 2 from anesthetic and 2 from infection.

This monograph is well worth reading and for those especially interested, the legal aspects and the laws of the various states dealing with sterilization, to be found in the appendix, will be of value.

Hamilton²⁸ has, on the basis of 200 married persons, serious minded and educated, compiled the intimate and extensive self-revelations of these individuals of whom at least one-half are supposedly normal. The object of his queries is to find out what had happened to them in childhood as well as their present beliefs, attitudes, predicaments, and characteristic modes of performance with reference to sex and marriage. To get at the basis of this, 372 questions were asked of the average woman and 334 were posed to the male. The volume consists of a large amount of statistical information in somewhat undigested form. The basic question posed is summarized at the end of the book, "Is marriage in itself a faulty institution in that it prescribes a mode of relationship between spouses which tends, in the end, either seriously to impair or to destroy an originally established congeniality and an originally high sexual reactive value of spouse for spouse? Or does the fault lie essentially in the kinds of reactive equipment that environmental influences tend to build up for us throughout infancy, childhood, and adolescence?" I feel that the author has not satisfactorily answered his own inquiry.

MISCELLANEOUS

Stone and Calculous Disease of the Urinary Organs by J. Swift Joly²⁹ is a very detailed monograph emanating from the pen of a man with a sufficient personal experience backed by that of St. Peter's Hospital for Stone. In addition, the world's literature has been thoroughly digested and drawn upon in this monograph which deals exclusively with calculi of the urinary tract. The author says that in the last fifty years there is a marked change in the clinical picture and character of calculous diseases. He gives a delightful and elaborate historical sketch which alone would make this book worth while. Next, the composition, formation, and general characteristics of calculi are described. Stone in the bladder is becoming less frequent. This is especially noticeable in Great Britain, Holland and Lorraine. In India certain districts are particularly prone to bladder calculus and certain races likewise. The Egyptians in contradistinction to the negroes are affected in Egypt. A monotonous diet and one mainly of carbohydrates seems to favor bladder stone.

²⁸A Research in Marriage. By G. V. Hamilton. Albert & Charles Boni, Inc., New York, 1929.

²⁹Stone and Calculous Disease of the Urinary Organs. By J. S. Joly. The C. V. Mosby Co., St. Louis, 1929.

The subject of renal calculi is dealt with, particular attention being paid to the functional tests. The operative descriptions are clear, concise and well illustrated. Then, in turn, ureteral, bladder, prostatic and urethral stones are taken up.

This monograph is impressive, not only because of its contents, but also because of its beautiful format, quality of the pictures, and x-ray and colored cystoscopic drawings which illustrate it.

*The Adolescent, His Conflicts and Escapes*³⁰ contains three chapters by Veeder. The rest of it is written by Schwab. This is a very pleasant and instructive book to read, both because of its smooth and excellent English and its impartial and readily understood method of presentation. A very sane attitude of reserve in accepting the rôle of the endocrine glands as a causation of indefinite symptoms is shown by the authors. They refuse to be misled by fantasy and glamour. Veeder emphasizes that between the thirteenth and sixteenth year the adolescent requires five thousand calories daily, more than one-half times again as much as the average farm hand needs. Numerous vital questions are taken up. Among them I instance merely the methods to be employed in enlightening boys and girls about sexual matters. The question of selection of exercise and sports is not easy to settle. At present no subject is more frequently discussed by educators and parents than the complexes encountered and the difficulties of the adolescent in adapting himself to the taboos, duties, tasks and responsibilities which present themselves to him.

Innumerable questions which constantly arise for those who are dealing with the young, are presented in a convincing fashion and should prove of the utmost aid in solving difficulties. The Freudian psychology, the Freudian concept of infant sexuality, sex from the point of view of its universality, are presented in such a manner that they are equally understandable to the lay as well as the medical reader. What I enjoyed most was the soundness, the balanced impartiality, and the excellent literary style of presentation.

The ambitious *Handbuch der inneren Sekretion*,³¹ edited by Hirsch, is beginning to approach a conclusion.

Volume II, the 5th installment, contains an article on hermaphroditism and transformation of sex by Berner of Oslo. The author discusses the nomenclature in great detail. He deals largely with the literature of human cases and likewise takes up the question of bird hermaphroditism. Much of the discussion is purely theoretical. In speaking of secondary sex characters, it appears to me that the investigation of Lillie's group, by means of which the plumage of castrates could at will be changed in a female or male direction, depending upon the type of sex hormone injected, should definitely settle the question in favor of the control of these characters by the sex hormone of each gender. On the whole, this contribution, although of value, appears unduly confused and theoretical.

The seventh installment of Volume III contains an article on func-

³⁰*The Adolescent, His Conflicts and Escapes.* By S. I. Schwab, M.D., and B. S. Veeder, M.D. D. Appleton & Co., New York, 1929.

³¹*Handbuch der inneren Sekretion.* Band II, Lieferung 5. Band III, Lieferung 7. Edited by Dr. Max Hirsch. Curt Kabitzsch, Leipzig.

tional diagnosis by Breitmann of Leningrad as well as by Much on the foundations of organotherapy.

Breitmann lays down three possible methods of investigation, the first morphologic including anthropometric and roentgenometric, the second functional, and the third dependent on the correlation of the various glands. I am quite unable to follow the author in his theoretical aberrations. For example, he describes eighteen constitutional types and has many "functional tests" to aid him in the division. Basedow is divided into amphotonic, vagotonic and sympatheticotonic. Such a speculative division does not lend itself to critical reviews.

Much, of Hamburg, subtitles his contribution *A Critical Sceptical Study*. Would that he had kept himself strictly limited to this praiseworthy point of view. On the other hand, he considers Basedow and myxedema both "dysfunctions," a point of view which the most modern chemical researches appear to disprove. However, I can agree with him that if adrenalin and insulin are documented as the purest types of hormone, our viewpoint must be entirely revised. They are chemically purified partial products with typically clean-cut chemical actions. Unfortunately the author beclouds all the issues discussed in a mass of verbiage and ignores or has failed to inform himself of many of the most striking recent physiologic discoveries. Referring back to his subhead, I would classify his reaction not as healthy scepticism but as a purely academic negativism.

Volume III (1927-1928) of the *Internationale Radiotherapie*³² under the continued editorship of Wetterer, is at hand. This large volume of 1329 pages contains in well arranged form much of what has been published in radiotherapy during this period. More than one half of the volume is occupied by abstracts covering the main subjects of physics and technics, radiotherapy and allied provinces, the biologic effects of roentgen and radium rays, light, and related physical agents. In succeeding chapters dermatology, gynecology, malignant tumors, tuberculosis, internal medicine, genitourinary and other specialties are taken up. A number of articles on special subjects by well-known authors are included. A considerable portion of the book contains summaristic reviews as well as congress reports. Wetterer himself has added an appendix on the radiotherapeutic treatment of malignant skin tumors. The volume forms a useful source of reference in this special field.

Three volumes of the *International Clinics*³³ have been received. They are the index number of 1928 and the March and June numbers of 1929.

The first contains an article by Bird which emphasizes the importance of the visualization and study of the appendix in gastrointestinal x-ray examinations. Pfahler gives a review of the world's statistics as well as his personal statistics dealing with the efficacy of radiotherapy in malignant diseases, especially of the mouth, breast, and uterus. Higgins reports 18 cases of horseshoe kidney operated upon for stone and other indications.

³²Internationale Radiotherapie. By J. Wetterer. Band III. L. C. Wittich, Darmstadt, 1928.

³³International Clinics. Vol. IV, 33th Series, December, 1928; Vol. I, 39th Series, March, 1929; Vol. II, 39th Series, June, 1929. J. B. Lippincott Co., Philadelphia.

The March issue of 1929 contains three clinics by Lewellys Barker on a variety of subjects. d'Herelle has an article on Bacteriophage in Relation to the Phenomenon of Recovery. Baehr and Klemperer discuss various types of jaundice.

In the June issue there is an interesting article by Lodholz on the "Maternal Side of Femininity" in which he tries to demonstrate that the maternal and sexual functions are independent. This applies to both sexes. For example, male capons show a much higher paternal reaction than the uncastrated male and are frequently utilized by poultry breeders for covering the eggs. The author traces the maternal reaction through the ovum, pregnancy, birth. He discusses the eating of the placenta by both carnivora and herbivora, without, however, apparently being aware of the physiologic reasons for this ingestion. He then discusses nursing, the fear reaction and the maternal protective mechanism. He draws attention to the prepuberty manifestations of the maternal reaction in children and young girls, and its persistence in the senium. He next discusses hyperdevelopment of the maternal instinct and "Niobe complex," the overindulgent mothers, their excessive maternal care, and finally ends up with perversions of which those found in the animal kingdom, cannibalism is the most striking instance.

*Progressive Relaxation*³⁴ by Jacobson is a serious physiologic study with the intention of discovering the margin of nervous elements and muscular unrest in disease, taking up especially the problems of fatigue, debility, and lowered resistance. The author claims that in neurosis there is a failure to relax and that a cure can be obtained by educating the patient to quiet the nervous system and obtain full muscular relaxation. This stage of nervous overexcitability he calls nervous hypertension, to be compared to the arterial hypertension. He further claims that nervous hypertension and neurasthenia are identical for all practical purposes. After having given such a definition, how he can then seriously speak of the nervous hypertension seen in febrile bacteriologic diseases is inexplicable to me. Jacobson says that even in response the average individual has a "residual hypertension" and that it requires habit formation to train such an individual to obtain full muscular relaxation. His technic is described in detail and is mainly practiced by patients in the recumbent position.

However, "differential relaxation" can be applied to the performance of muscular actions and that, according to him, signifies the minimum of tension in the muscles requisite for an act along with the relaxation of other muscles. As an example he gives the speaker with a trained voice who does not tire even after prolonged effort if he keeps his throat "differentially relaxed." A large part of the book is given to the detailed record of observation in the psychic and physiologic laboratory. This effort impresses me as a serious study which may be of great use to the trained psychologist and neurologist. I sincerely hope that it will not be taken up by any faddists who would run it to the ground.

Pruitt emphasizes that the *injection treatment of hemorrhoids*³⁵ is no longer in the hands of quacks. He gives a systematic, short, well-

³⁴*Progressive Relaxation.* By E. Jacobson. University of Chicago Press, Chicago.

³⁵*Injection Treatment of Internal Hemorrhoids.* By Marion C. Pruitt. The C. V. Mosby Co., St. Louis, 1929.

presented description of the symptoms, diagnosis, and treatment of internal piles. The treatment is ambulatory and consists of injection of carbolic acid in a solution of water and glycerin.

Another short description of the injection treatment of hemorrhoids is by Miller,³⁶ who, to judge by the circulars at the beginning of this small pamphlet, is interested in many phases of surgery usually not specialized in by the same individual.

³⁶The Injection Treatment of Hemorrhoids. By C. C. Miller. Modern Surgery Publications, Chicago, 1929.

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FACTORS IN THE SEX LIFE OF 2200 WOMEN. By Katharine Bement Davis, Ph.D. Harper Brothers, Publishers, New York, 1929.

THE NEW-BORN INFANT. By Emerson Stone, M.D., assistant clinical professor of obstetrics and gynecology, school of medicine, Yale University, etc., etc. Lea & Febiger, Philadelphia, 1929.

PATHOLOGY FOR STUDENTS AND PRACTITIONERS. By Dr. Edward Kaufmann, professor of general pathology and director of the pathological department, university of Goettingen. Translated by Stanley P. Reimann, pathologist and director of the research institute of the Lankenau Hospital, etc. In three volumes. P. Blakiston's Son & Co., Philadelphia, 1929.

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INTERNATIONAL CLINICS. Vol. III, 39th series. J. B. Lippincott Co. Philadelphia, 1929.

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AMERICAN ASSOCIATION OF OBSTETRICIANS,
GYNECOLOGISTS, AND ABDOMINAL
SURGEONS

FORTY-SECOND ANNUAL MEETING, MEMPHIS, TENNESSEE
SEPTEMBER 16, 17, AND 18, 1929

PRESIDENT'S ADDRESS

RECENT IMPORTANT ADVANCES IN OBSTETRICS
AND GYNECOLOGY

BY G. VAN AMBER BROWN, M.D., F.A.C.S., DETROIT, MICHIGAN

MY FIRST and most pleasing duty is to thank you all for having elected me President of this organization, thus giving me the great honor I hold today.

Before proceeding with the subject in hand, permit me also to express the hesitation I feel in attempting to review the progress made in obstetrics and gynecology during the last few years. It is a task far beyond the scope of one paper. At best, I can only hope to indicate briefly a few of the most important advances which, in addition to their practical value, offer most promise in new fields of investigation for the future. The victories gained, the magnificent results secured become so increasingly marvelous with each passing year that they arouse astonishment, admiration and enthusiasm.

Composed as this association is of distinguished obstetricians and gynecologists, it is obvious that this task is fully as difficult as it is fascinating; and it is undertaken with an earnest appreciation of per-

*All of the papers included in this issue of the Journal were read at the Forty-second Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Memphis, Tennessee, September 16, 17, and 18, 1929. The remaining papers and discussions will be printed in the March issue.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

sonal limitations in ability to narrate in a fitting way the recent triumphs of our great profession in these two specialties.

I want to call your attention first to the concept of woman as a psychophysical organism in a social and biologic environment, rather than as a member of the female sex of indifferent background with a few pathologic foci of interest for the medical practitioner.

Progress in the field of gynecology is being stimulated by a growing appreciation of the importance of the rôles played by psychologic and sociologic considerations, for who can consider the sexual life of a woman apart from the distortions and modifications to which it is subjected by economic and moral demands of social life? The significance of tracing the functional origin of many gynecologic diseases, always stressing the importance of treating the woman and not the womb, is a new viewpoint that should be stressed today by all teachers and practitioners of obstetrics and gynecology. The problem is often concerned, not with the treatment of symptoms, but with the readjustment of the maladapted organism to its environment.

In this rather cursory examination of some of the recent findings, it will be necessary to consider more isolated problems in what may be called "note fashion." Some of these notes will pertain to practical discoveries, others to more theoretical investigations.

Abnormality of Germ Cells.—With a progressively falling birth rate and the evident desire of many individuals to shirk the responsibilities of parenthood, the question of sterility is today of considerable importance. Sterility is a fairly common condition, and it is possible that deliberate anticonceptional measures, if practiced for any length of time, directly or indirectly, tend to produce a permanent afertile state.

Important work has been done in the gynecologic problem of sterility, work which has opened entirely new fields of research. This development has advanced in the last few years, and holds much promise for all who are interested.

Moench, Mason and Friedlaender have been very active in this line of research work. Friedlaender (Detroit) has demonstrated that the 17 per cent of sterility cases which were classified by him in 1922, as "causes not determined," were all due to abnormalites of the male germ cells. The condition is usually explained by pathologic processes existing in the testicle, but the vitality of the spermatozoa is probably also readily influenced by the character of the secretion of the accessory glands, or constitutional anomalies of the male or both. Even in the apparent absence of orchitis, disturbances of the testicular germinal epithelium and of the spermatozoa can be shown to occur with great frequency in this 17 per cent of cases. All parts of the germ cell are fully developed, but the nucleus is atrophic. This lessening in size of the nuclear elements of the sperm results in a great variety of differently shaped heads. In some, the nucleus is repre-

sented by a bar not much greater in diameter than the connecting piece; in others, there is a gradual tapering off to a point; in still others, cells may be seen in which the tapering, beginning at the nuclear membrane, is abrupt. In the latter the longitudinal measurement of the cell is much lessened, resulting in an almost hemispherical mass. Few abnormal cells are motile and a large number are ejaculated minus their tails. The occurrence of tailless spermatozoa is quite common in the 17 per cent sterility cases and is usually accompanied by further morphologic changes in the nuclear portion of the head.

The findings so far have thus clearly demonstrated that the cause of sterility in the male, leaving aside the physical and psychic elements, is pathologic change occurring in the essential genital organs, which are evidenced clinically only by an alteration in the character of the seminal fluid and the spermatozoa contained therein.

Chemical Reaction Endocervium.—It is generally believed that the cervical secretion may be acid in some cases and excessively alkaline in others, but the cervical reaction is almost constantly and definitely alkaline, as is shown by the splendid studies of Meaker and Glaser. The hydrogen-ion concentration of the endocervical secretions is quite constant. In 100 patients studied, regardless of age, parity, hypoplasia, day of menstrual cycle, endocervicitis and viscosity, following a most painstaking technic for ascertaining the hydrogen-ion concentration, the following observations were made: (1) The cervical reaction was found constantly and definitely alkaline, ranging from P_H 8.0 to P_H 9.0 and being above P_H 8.5 in about 80 per cent of cases. (2) The cervical reaction was not notably influenced by age, parity, the menstrual cycle, endocervicitis, or viscosity of the endocervical mucus. (3) That the vaginal reaction was ordinarily unimportant in relation to fertility or sterility.

The direct spermatoxic effect of a diseased cervical mucosa is however vividly depicted by Reynolds, who, utilizing Hühner's post-coital method for the observation of spermatozoa aspirated from the cervical cavity, states, "It is extremely interesting to see how actively motile spermatozoa progress across the field of the microscope in a cervical secretion of grossly normal appearance, until they come in contact with small clumps of pus-cells, with which the tail of the spermatozoon becomes entangled. The result then is, that it indulges in futile struggles to escape, by the violence of which it becomes exhausted, and in a few minutes gives up the struggle and lies still."

The sterility of women with conical cervix, cervical flexion, or pin-hole os, is never due to the cervical malformation per se, but to a coexisting endocervicitis. An os that offers sufficient egress for millions of blood cells during every menstruation, will readily afford ingress to a spermatozoon whose diameter measures less than that of a

single corpuscle. We constantly encounter fecundity in cases of uninfected pin-hole os, and sterility in widely gaping lacerated infected cervixes.

The normal cervical lining is not essential to conception or gestation, but a diseased lining is inimical to both, and should be treated by surgical procedure. Removal of a cone by the method of Arnold Sturmdorf should be the procedure of choice. Sturmdorf says, "I would not dogmatically attribute the cure of sterility to this operation any more than to other procedures, for there is too much that is unknown and unknowable involved in the problem; but I may assert, after a very extensive and critical trial, that the method as outlined radically eliminates chronic endocervicitis—the one established causative factor in the sterility of cervical origin."

Relationship Between the Endocrine Glands and Genital Organs.—At this point, we wish to mention the research work of Zondek and Asehheim who have apparently solved a most important problem on the interrelation between the endocrine glands and the genital organs. Their work has shown that the doctrine of "priority of the ovum" as was taught by many investigators was not convincing. They have proved that in animals after the radiation of the ovaries with large doses of x-rays, the estrus continues, although not one living ovum can be seen histologically. From this they have concluded that the ovum could not be superior to the ovarian hormone; on the other hand they have shown that the ovarian hormone could not influence the ripening of the ovum or follicle. They have further shown in a positive manner that the hormone of the anterior pituitary gland can hasten and produce ovarian function; that is the formation of follicles, production of hormones, and ripening of the ovum. They have succeeded in establishing the evidence of the endocrine relation between the anterior pituitary gland and the genital organs. This was known to a certain extent for a long time in the syndrome of dystrophia adiposo-genitalis and other anomalies.

Relation of Menstrual Cycle to Pregnancy.—In spite of the interesting findings of Zondek, we are still in the dark concerning some questions. Why is it that a regular menstrual cycle occurs if no pregnancy takes place? We probably can explain this by a central regulating system, the character of which is still unknown. Must we allot a greater significance to the living, nonpregnant ovum than we have been accustomed to do? In this respect the work of Allen, Doisy, Papanicolaou, and others is very interesting. They have shown that in spayed mice, the cornified epithelium of the vagina which is a sign of estrus can be produced over a long period by the injection of ovarian hormones. This cannot be done in sexually mature mice where, despite the large doses of hormone, the normal periodic cycle results and predominates. Gravid animals do not react at all to these

hormones. The mice can only be brought to a continued estrus if impregnated, or when impregnable ova are not present. The periodically appearing impregnable ova regularly disturb the estrus. In a normal estrus, the hormone of the anterior pituitary body, which Zondek designates "prolan," also has no effect on the cycle. During pregnancy, an increased amount of anterior pituitary hormone has no power to produce the ripening of new ova. We may then conclude that the ovum has an influence, superior even to that of the anterior pituitary body in the sexually mature organism. The essential factor then is the ovum only. It determines the rhythm and the periodicity of the cycle.

Relation of Anterior Pituitary Body to Pregnancy.—In further comprehensive studies, Zondek and Aschheim have investigated the relation of the anterior pituitary body to the organism of the pregnant woman. They have found the ovarian hormone in the gravid corpus luteum up to the fourth month; in the cortex of the ovary where it is combined with the theca cells of the atretic follicles; and in the mother's blood from the fourth month of pregnancy until the first few days of the puerperium; in the milk during the first few days after delivery, in the cord blood and, principally, in the urine of the mother from the fourth month of pregnancy until the puerperium in increasing quantities up to 1000 mouse units per 1000 c.c. of urine. As the ovary produces relatively small quantities of hormones, we must conclude that the placenta, which is found to harbor large quantities of hormone, must be its most prolific source.

Besides the ovarian hormone, Zondek and Aschheim were able to demonstrate the hormone of the anterior pituitary body in different tissues of the pregnant woman, as well as in the blood and urine. On the basis of the fact that the hormones appear in the urine of the pregnant woman a few days after the impregnation of the ovum, Zondek and Aschheim have developed a method of early diagnosis of pregnancy by injecting a small quantity of the woman's urine into an infantile mouse thereby producing ripening of the follicle, corpus luteum formation and signs of estrus as shown by cornified epithelium in the vaginal smears. The experimental evidence presented serves as the basis for a valuable diagnostic method in early pregnancy thus making available for clinical application these purely scientific investigations.

An attempt to extend this work to human beings is now being made and considerable progress has been attained. Dr. Papanicolaou finds that the various stages of the ovarian cycle in the human being may be detected with considerable accuracy by examination of vaginal smears. The human smear is somewhat more difficult to analyze than that of the lower animals, but with experience it seems perfectly practical to use it as a general indicator. In working with human beings

it has also been found that early stages of pregnancy as well as other abnormal conditions of the ovary and uterus may possibly be detected by characteristic changes in the nature of the vaginal smear as modified by pregnancy and his study is being actively continued at the present time. However much more clinical investigation is necessary in order to understand thoroughly the changes in the pregnant uterus which may modify the nature of the vaginal secretion.

Finally, in the light of the recent advances which have been made by the use of the vaginal smear method we are encouraged to hope that much accurate quantitative knowledge may soon be obtained regarding the functions of the various ovarian secretions. This method of study also furnishes a clear-cut means of detecting the influence of the secretions from other endocrine glands on the ovarian reaction. The relationship between the thyroid and pituitary and the ovary may be further elucidated by the present methods of study.

It is a remarkable fact that the vaginal smear is a histologic indicator as accurate and clean cut in its response to chemical changes in the body as is any other type of diagnostic reaction and as such may aid in facilitating the more accurate chemical isolation of gonadal hormones.

In discussing the physiologic principles of the Zondek-Aschheim reaction of pregnancy, Brühl reports the results of the test in 192 cases. On the basis of his observations he concludes that the test gives correct positive or negative results in nearly all cases.

We must sound a word of warning here. We must not judge the complex synthesis and analysis in the woman's endocrine laboratory in a one-sided manner. We must not forget the regulating influences of the whole endocrine symphony. Mahnert has shown that the stimulating effect of the anterior pituitary hormone on the graafian follicle is regulated during the height of ovarian hormone, while the secretions of the other endocrine glands are not able to perform this regulatory function. Especially interesting are the findings of Baniceki, Berlinger and Adachi, who were able to produce typical pregnancy changes in the anterior pituitary gland by the injection of placental substance. These changes are evidenced by an increase of the chief cells, and a relative decrease of the eosinophiles at the same time. If we consider that, according to Zondek and Aschheim's experiments, we find a large amount of ovarian hormone in the placenta, it is reasonable to believe that the changes found during pregnancy in the pituitary are mostly caused by the ovarian hormone. This was further corroborated by repeated injections of ovarian hormone in male and female animals. Only the female animals showed changes in the pituitary gland. This leads to the conclusion that the ovarian hormone is sex specific. The same changes can be noticed after the injection of urine from pregnant women in which the ovarian hormone

has been demonstrated. From this, we conclude that although the pituitary hormone is of great importance in the woman's sexual life, nevertheless, the ovary predominates over its function and still remains the sovereign over the female sexual life.

Importance of the Uterine Hormones.—In considering all of the internal secretions in relation to the reproductive organs of the woman, investigators have been in the habit of considering the uterus of secondary importance, although Henkel in 1911 showed the existence of a definite relationship between uterus and ovaries. That the ovaries undergo very severe degenerative changes after hysterectomy has been repeatedly demonstrated. This was ascribed to trauma and other causes, no one holding the endocrine disturbance of the uterus responsible for it. Zimmerman, through very interesting experimental work, seems to have settled this question. After extirpation of the uterus he found typical changes in the ovaries. In rabbits he found after two months a breaking down of the ovum in the graafian follicle, and after six months small cystic degeneration of the ovaries. Where uterine tissue was transplanted, the above-mentioned changes did not take place. This is evidence enough to show that the changes in the ovaries are not the result of trauma incident to the hysterectomy, and that the uterus through some hormone of its own is essential for the preservation of a normal ovary. Zimmerman also showed that the uterine hormones are located in the endometrium, for as long as there was any endometrial tissue present in the transplanted uterine tissue there were no destructive changes found in the ovaries of the animal.

Animal experiments seem to prove quite definitely that the ovarian follicular hormone is not the only hormone produced by the ovary. The corpora lutea produce one that amplifies the reaction which has been started by the ovarian follicular hormone. Under the influence of the latter, the mucous membrane lining of the uterus develops to several times the thickness it has when quiescent. At the end of this proliferation phase the ova are released from the ovaries and descend through the tubes into the uterus. The corpora lutea quickly develop in the cavities vacated by the ova, and elaborate a hormone which causes great development of the glands in the uterus.

In this condition, the mucous membrane furnishes a peculiarly suitable place for fertilized ova to attach themselves and receive nourishment and stimulation for their development. This sensitization of the mucous membrane of the uterus, so that the ova will become attached to it, is the most important function of the corpora lutea. In addition, they have an inhibitory action on the follicular part of the ovary, and they delay the production of the ovarian follicular hormone, thus preventing excessive stimulation of the uterus itself, which might interfere with the development of the ova into embryos.

In case the ova have not been fertilized or fail to attach themselves to the uterus, the corpora lutea lose their activity after a few days and the cycle ends in degeneration and casting off of the lining of the uterus. Therefore, by properly combining the use of ovarian follicular hormone with an extract of corpora lutea, which contains lipoids of corpora lutea, the normal series of events in the uterus can be simulated. The proliferative phase can be produced by the ovarian follicular hormone and the secretory, or glandular, phase can be produced by the lipoids of corpora lutea. This use of these two ovarian products is in accord with the ideas of Emil Novak, who has published several articles on the subject. To sum up the clinical uses of these two products it may be said: The specific indications for ovarian follicular hormone are of course menopause, either natural or surgical, sexual frigidity, and the abnormalities of menstruation, such as dysmenorrhea and menorrhagia. Excellent results are obtained by using ovarian follicular hormone during the first half of the month following menstruation and corpora lutea extract during the latter half.

Contractions of Uterus.—Another important investigation has been made by Knaus, who has demonstrated that the isolated uterus contracts in a quicker rhythm than the uterus in situ. This is due to the separation of the inhibitory nerves located in the central nervous system. What seems to be highly interesting is that in the gravid uterus of the rabbit the pregnancy up to the seventeenth day cannot be interrupted, even with large doses of pituitrin. This is shown in the uterus in situ, as well as in the isolated extirpated uterus. From the eighteenth day of the pregnancy the condition of the uterus changes to a great extent. It is possible then to induce an abortion with very small doses of pituitrin. This is of great scientific and clinical importance. It is believed that the change in the contractibility of the uterus is brought about by the endocrine hormones of the genital system which influence the uterine muscle cells in a specific way, and which cannot be removed even by washing of the extirpated organ, so that the uterus keeps the motion impulse which it possessed at the time of extirpation. It has been shown that the uterine contractions differ during the first and second part of a pregnancy and during the puerperium. The inertness of the uterine contractions in the first half of pregnancy is ascribed to the hormonal action of the corpus luteum which neutralizes or paralyzes the hormone of the *posterior pituitary gland*. The piling up and formation of hormones in the placenta cause a steady increase in resistance of the uterus to the action of the hormone of the posterior pituitary until parturition sets in. During the puerperium we have, due to the inactivity of the ovarian function, a state which is allied to senility. With the application of these suggestive investigations to obstetrics, a vista of possibilities is unfolded relative to problems which have so

far remained unsolved. The etiology of missed abortion or missed labor is now brought closer to an intelligent interpretation than ever before. That the uterus does not respond very often to ecbolics in incomplete abortions, the primary insufficiency of labor pains without pathologic overstretching of the uterus by hydramnion or twins, are questions which will probably be solved by the research work of Knaus, and these solutions should lead us to a rational etiology and therapy.

A Specialized Type of Muscle in the Human Pregnant Uterus.—In a recent piece of work by Hofbauer, explanation may be found, at least in part, for the difference in uterine contractions during the first and latter half of pregnancy. Hofbauer calls attention to the development in the outer layer of the pregnant uterus of a specialized structure of muscle tissue with microscopic features in marked contrast to those of the rest of the uterine musculature and closely resembling the *Purkinje system of the heart*.

The study of the histologic structure of the wall of the pregnant uterus shows that beneath the peritoneal covering there is a thin superficial layer of relatively compact longitudinal fibers followed by a thicker layer of circular fibers spread apart by characteristically arranged connective tissue spaces containing many vessels. Internal to this is a layer of muscles interlacing in both directions, and internal to that is the bulk of the uterine muscle, which consists of a dense felt-like mass of fibers extending to the base of the decidua. The development of the longitudinal bundles is most pronounced in the middle third of the anterior wall. In the posterior wall the structure terminates half way between the fundus and the internal os. On the posterior wall of the lower uterine segment there is a superficial band of longitudinally arranged fibers which spreads horizontally toward both sides.

The specialized system in the outer portion of the pregnant uterus is visible to the naked eye as distinct longitudinal bands which are mainly parallel.

In the author's opinion, the system described may be designated as the pacemaker of the parturient uterus.

This peculiar formation may be demonstrated after the fourth week of pregnancy and is well developed by the middle of pregnancy. In the premenstrual period the muscle fibers of the outer layer show a definite swelling of their cytoplasm. The evidence indicated that the muscle structure described develops from the subserous connective tissue.

The Use of Thymophysin.—Thymophysin is a combination of the extract of the hypophysis and the extract of the thymus gland. Temesvary is given all the credit for the experimental work. He was able to show that by its injection into an animal, normal uterine contrac-

tions were rapidly and rhythmically stimulated. Following this work Graff in Vienna and others began to use it in their clinics and were able to show that in the great majority of cases labor could be excited and strengthened, while at the same time its physiologic character was preserved.

L. W. Haynes, who has had the largest experience with the use of thymophysin of anyone in America, in private correspondence states: "We started our work with this preparation in the fall of 1926 and have recently completed an analysis of the records of our first five hundred cases. Our indications for the use of thymophysin are primary and secondary inertia, and as an aid in the induction of labor. A summary of our results is as follows: Out of 424 cases of inertia, 280 gave satisfactory results for rapid delivery; 110 resulted in rapid, complete dilatation where surgical intervention was possible at a much earlier time. There were 34 failures in the inertia classification. In 74 cases we used it as an aid in the induction of labor. When used with other ecboics which are in general use, a rapid labor resulted in 49 cases. There were 27 failures in this group. No ill effects have been noted on either mother or baby."

Thyroid Dysfunction and Reproduction.—In these investigations of the action of the endocrines, we must, as has been previously emphasized, be extremely cautious not to consider the biologic facts in a one-sided manner. Doederlein, Junior, has called our attention recently to the relation of hyperthyroidism to reproduction of progeny. He has found that disturbances of the normal thyroid function diminish the chances of fertility; that this is true of hyperfunction as well as hypofunction. He has also shown that the consequences of hyperfunction of the thyroid differ with the sex. In the female, slight and medium hyperthyroidism interferes neither with the fertility nor the pregnancy, while the male fertility is reduced and the progeny is of inferior type. Severe forms of hyperthyroidism suppress the fertility or result in abortion. It is especially valuable to know that every hyperfunction of the thyroid renders the mother more prone to a stormy puerperium.

Knowing that severe hyperthyroidism is a cause of sterility, Haberland advocated the production of artificial sterilization in women by the administration of thyroid. But the doses required to obtain the desired effect were so large that they became dangerous to the health of the woman.

In our investigations of sterility we must therefore include the possibility of hyperthyroidism in one of the partners as a cause. This is especially so in the male, for, as we have mentioned before, slight or medium hyperthyroidism renders the men sterile.

The fetus also is affected by the hormones which circulate in the blood of the mother. These hormones penetrate the placenta and may

bring about a temporary disturbance of the metabolism of the fetus. Soon after birth this condition changes to normal, or nearly so, in healthy individuals. However, if there are signs or symptoms of exophthalmic goiter, or the mother actually has Basedow's disease, then there is always a congenital anomaly.

External Influences on Germ Plasm.—Here, too, there is evidence that even such complex molecular substances as the hormones are able to penetrate the placenta. That various chemical compounds are able to reach the fetus by way of the placenta has been known for a long time. It has also been known that certain microorganisms from the blood of the mother were able to reach the fetus and produce the same disease as the mother possessed. However, it was not known until recently, that even more highly organized microorganisms were able to infect the fetus by way of the placenta. This question was settled by the research work of Ernest Philipp, in Stoeckel's Clinic. His work showed a definite difference in the behavior of the trypanosoma and spirochete. The former cannot pass the placenta, while the latter infect the fetus diaplacentally. Their morphologic structure may be the cause of the behavior of these microorganisms. No structural changes can be found in the villi of the placenta which might have been caused by the peregrination of the spirochete. This conclusive evidence changes the view of the nature of infection of the fetus with syphilis from a germinative to a diaplacental process.

An interesting phase of the dangers attached to the early months of gestation is the biologic evidence put forward by Arthur Robinson indicating that the cause of some abortions lies in an inherent lack of vitality of the fertilized ovum. The product of conception dies in utero and unless retained as a carneous mole, is expelled as a foreign body. In many cases it is not possible to prevent abortion due to this cause. However, attempts based upon comparative physiology are being made to increase the vitality of the ovum by the addition to the diet during pregnancy of an increased quantity of Vitamin E, the recently discovered reproductive vitamin, the withholding of which from the diet tends to produce death of the fertilized ovum. This vitamin is present in certain foods in considerable quantity, notably in wheat, peas, and lettuce. Generally speaking it is found most abundantly in the lipoid extracts of cereal grains, but is abundant also in various kinds of leafy vegetables.

If as we now believe, a vitamin exists, that determines whether or not a prospective parent shall have any progeny at all, this is certainly an effect on the germ plasm and the principle once having been demonstrated simply needs more knowledge and instrumentalities to carry its application further. Going further than this, recent evidence is available proving the reversibility of sex in higher organisms. Such evidence supports the thesis of external factors being capable

of profoundly influencing the germ plasm. If such influence can affect a factor so important as the sex of an individual, it is a tenable postulate that every hereditary factor is in some degree under possible control or modification by scientific means. Thus according to Fisk, the supposedly inviolate nature of the germ plasm is shown to be a pure myth, a dogma that is finally laid at rest by scientific demonstration. In spite of the amazing and illuminating discoveries already made in cytology there is much territory that has not been touched.

Golgi Apparatus.—Let us consider, as an instance, the strange and bewildering organism, or organization, known as the Golgi apparatus. This apparatus may be either an organization or an organism, heterogeneous or homogenous, reflex or vital, no man can yet say. In the restricted and minute portion of each cell, we find a tiny bit of matter in ceaseless fluctuation and, having no better name for it, we call it after its discoverer and there we must, for the present, rest discontent. But while nothing is as yet known about its structure, much has been learned about its conduct. One of these tiny masses is found in each of the myriads of cells that form the complete morphologic structure we name the body. In fact M. Kolliner states that in the investigation of various groups of invertebrates he has come to the conclusion that Golgi's internal apparatus can be recognized in some form in every animal cell. There is a fairly constant form of apparatus in all vertebrates. Within the border of the cytoplasm this speck is in ceaseless and constant fluctuation, and this motion never ceases while life is in the cell. What the purpose of this motion may be, and whether we are here facing the final mystery of the "reason" of biologic vitality, are at present subjects for speculation and research; but the fact that there is fluctuation is established. For much of what is known upon this subject we are indebted to that gifted Japanese scientist Mayagawa.

We are also indebted to C. deFano, who after much experimental work states that in advanced pregnancy the apparatus gains in size, out of proportion to the volume of the cell. After the young are born the apparatus is smaller, apparently due to compression of the secretion in the cytoplasm. During lactation the apparatus is almost identical with that seen at the end of pregnancy. This same author also claims that Golgi's apparatus is a constant feature of the epithelial cells of the mammary gland (mice, rats, cats, rabbits, and guinea pigs). During pregnancy it hypertrophies; and it remains hypertrophic throughout lactation, when it is in part fragmented and shifted and stretched in various directions. It is not a fixed system of intraprotoplasmic canaliculi. During evolution after lactation this apparatus becomes transformed into peculiar shapes delineated by argentophile material. Most of these cells are eliminated. Some remain as permanent epithelium in which the apparatus is not thrown off with secre-

tory products, but detached cells with their apparatus pass into the glandular lumina, so that in this way the apparatus may take an indirect part in the function of the gland.

The bearing all this has upon our knowledge of obstetrics and gynecology bids fair to be far reaching. Recent observation has shown that when there is a threatened carcinoma, the Golgi apparatus is subject to change in derangement of pattern in that one organ where cancer is forming; so that in a short while a technic of observation may be developed that will warn in time of the approach of this dreaded foe of man. Indeed if the present knowledge of the Golgi apparatus is applied, that warning may even now be observed.

For recent advances in our knowledge concerning this most fascinating subject, particularly during the last four years, we are greatly indebted to DeFano of the Spanish School, and to those especially interested in this line of investigation, I recommend the works of M. Avel on the *Physical Properties of Golgi's Apparatus in Sexual Cells of Gasteropoda*, also that of Z. Grabowska on *Golgi Apparatus in Spermatozooids of Crustaceans*, also *Microscopical Researches on Thyroid Gland of Amphibia with Special Regard to Golgi Apparatus*, by Z. Hirschlerowa.

CONCLUSIONS

From this brief review of recent development in obstetrics and gynecology, it is quite evident that rapid advancement is being made in the more essential biologic problems connected with the normal and abnormal morphology and physiology of the female genitalia.

The magnificence of biologic discovery should command even greater awe than it is accorded. Our present knowledge compared to all that can be known is ludicrously slight. We are intellectual machines geared closely to the past by considerations of conformity, reverence, ease, convenience, safety, and luxury. These factors serve to enslave free speculations and allow but glimpses of the truth. Dazzling discoveries lie outside the narrow mold of conformist thought. Only by wide outlook will they be revealed.

Breadth is required and depth. The broad man who never delves below the surface cannot grasp the significance of complex relationships. The deep theorist of limited information lacks the ability to apply his ideas.

All basic sciences are of vital importance to complete understanding, the basis of effectual progress. They are intimately and fascinatingly related to each other and to the more useful activities of mankind. This should be the basic principle of teaching, rather than dogmatic insistence on this, or that, academic requirement. A steady frictionless flow of discoveries then would result, instead of a retrospective nightmare of a long road of learning traversed in a strait-jacket under the goad of humiliation. It would be the beautiful shrine

of inspiration, pleasant to recall and eagerly sought out again and again. The fount of learning would then become the friend and adviser, and corroborator of those who have learned.

Our plea should be for methods of medical education, that are conducive to the correct mental attitude of the future investigator, methods that will stimulate the powers of perception and make every student an interested observer and investigator from the very beginning of his professional career.

The biologic viewpoint, when rightly pursued, will eventually elucidate the many problems with which we have been grappling, and with which we are today so much concerned. Schools should, I believe, aim at encouraging a comprehensive and inclusive outlook, not at destroying originality by overloading the young mind with a multitudinous array of facts. With a carefully studied coordination of biologic fundamentals, the student cannot but be impressed and imbued with the important conception of ultimate values, better fitting him for the investigation not only of the biologic aspects of any problem, but for the study of its purely clinical side as well.

Efforts should be made and methods promulgated by which the well-beaten paths of biologic and clinical studies may be eagerly pursued, as well as those yet uncut through virgin territory.

Only by way of physiologic and biochemical research, and by a comparative study of the simpler structural forms, shall we be able to bring our fascinating art into the realm of scientific perfection.

THE NEW PHYSIOLOGY OF MENSTRUATION AND ITS
PRACTICAL IMPLICATIONS IN OBSTETRICS
AND GYNECOLOGY

THE JOSEPH PRICE FOUNDATION LECTURE*

By R. W. JOHNSTONE, M.D., EDINBURGH, SCOTLAND
(*Professor of Obstetrics, University of Edinburgh*)

JOSEPH PRICE, in pious honor of whose memory this lecture is offered, lived to see the beginning of the rapid progress in gynecologic pathology which the great increase in gynecologic operating enabled us to make in the early part of this century. That we have not yet been able to equal that progress in the domain of physiology is one of the reproaches of modern gynecology. There are, of course, several good reasons for this, inherent in the nature of the subject. There is the inevitable paucity of physiologic, as compared with pathologic, material provided by our operative procedures; there is the difficulty which a right and proper delicacy adds to the requisite clinical observation of normal function; there is the difficulty of making accurate experimentation on the human subject; there is the difficulty in accurately correlating with human physiology the results of experimental observations carried out in those lower species of animals which most readily lend themselves to such researches. Lastly we have only just succeeded in freeing the subject of menstruation from the trammels of tradition, superstition, and false modesty, which for centuries wrapped it round as with swaddling clothes, and baffled any attempt to investigate its real nature. As a result of all these difficulties, the study of the crucially important function of menstruation has been hindered, and consequently also the proper comprehension of the disorders of this function, which form so large a proportion of the symptoms met with in gynecologic work.

One unfortunate result of our ignorance has been to open up the whole field of menstrual disorders as a happy hunting ground for the empiric endocrine-enthusiast under the not wholly disinterested guidance of the manufacturing chemist. Another has been to expose the sufferers from such disorders to quite unnecessary and unwarranted operations, especially curettage; or to the more incalculable and vastly more irremediable influences of radium and x-rays. That these lines of treatment have probably a great future, when guided by knowledge, is beyond question, but at the outset I would like to sound a note of caution. Every new observation of a really scientific nature regarding the infinite interdependence of the ductless glands only reveals more clearly the

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miraculous complexity of the human organism. One can hardly avoid a shudder when one thinks how often our efforts at treatment must be the merest ignorant and blind tinkering with a mechanism of supreme delicacy; and those of us who would aspire to membership of the angelic band in our profession must see to it that we at any rate tread warily and fearfully, whatever others may do.

These preliminary observations lead me straight to the core of my project, namely, to attempt to summarize lucidly and simply the main results of modern biologic and physiologic researches on the subject of menstruation in so far as I know and understand them, and to present them in a form which we, as working obstetricians and gynecologists, can grasp and handle in our work. The scientific study of menstruation may be taken as starting with Heape's brilliant research in comparative physiology, whereby he worked out an analogy between menstruation in the human female and the preestrus in the lower mammals. It is no part of my purpose to examine in detail the evidence for and against this theory, which has been generally accepted during the last twenty years, and is still championed in the latest edition of Novak's admirable monograph. Rather would I try to put before you the more recent view which seems to me more convincing, and leave it to you to form each his own judgment.

In approaching the subject, the first point which requires to be clearly apprehended is that in all female mammals the generative organs, taken as a whole, have two distinct functions to subserve. One is the sexual or copulative function, whereby the female receives the male gametes into her genital tract; and the other is the reproductive function, which begins with ovulation and includes gestation, parturition, and lactation. We must keep these two functions quite distinct in our minds, for upon that distinction depends our understanding of the problem. In the lower mammals both the sexual and the reproductive functions occur at regularly recurring intervals, so that we have what we may call a sexual cycle and reproductive cycle, each essentially distinct from the other.

The sex cycle of the lower mammals is characterized by the regular recurrence of periods of estrus or sexual desire, and for the performance of the sexual act the genitalia of the female require special preparation. The opening of the vagina becomes enlarged, the vaginal epithelium becomes cornified, the uterus becomes enlarged and congested, and the secretions of the genital tract become increased—all with a view to the reception of the male gametes and to facilitate their swimming up into the oviducts. After the sexual congress, which almost inevitably occurs at this period in animals living in a state of nature, the genitalia begin to regress, and in some species there is actually a sanguineous discharge at this regressive stage, due to the congestion of the whole genital tract. It was the regular recurrence of this discharge,

along with the other phenomena, which has led to its being generally regarded as the analogue of menstruation in the primates and in the human female; and while the analogy is tempting, I believe it to be incorrect.

The second or reproductive function begins with the maturation and dehiscence of the ovum, and in all mammals ovulation is followed by a series of changes in the ovary and the uterus, designed to prepare for the nidation and gestation of the fertilized egg or eggs, changes consisting in the development of the corpus luteum in the ovary and in the vascularization and sensitization of the endometrium of the uterus and its metamorphosis into what we call the decidua. If the fertilized egg is forthcoming, and in the lower animals living in a state of nature it may be assumed that it almost always is, the reproductive cycle continues over the period of gestation and lactation and ends by the return of the ovary and uterus to their "resting" condition, in readiness for a repetition of another reproductive cycle.

If the fertilized egg is not forthcoming, the changes in the ovary and uterus, preparatory to gestation, occur nevertheless and continue up to a point. Very soon, however, the uterus realizes that its preparations are in vain and this condition of partial preparation in the absence of a fertilized ovum, which is known as pseudopregnancy, comes to an end in the return of the organs to the resting condition. The important point is that the reproductive cycle always *begins* in these animals, irrespective of whether an ovum has been fertilized or not; only its duration is determined by the presence or absence of the fertilized ovum. Furthermore, we must remember that, as I have said, in animals living in a state of nature, the frequent correlation in time of estrus (and its inevitable insemination) with the occurrence of ovulation makes for such a high degree of fertility that the condition of pseudopregnancy is rare, as compared with that of true pregnancy. At the same time, the condition of pseudopregnancy is well-known in the bitch and in the rabbit, and can be produced experimentally in other mammals.

Now, when we come to consider the human species and the higher primates, we find conditions changed. The genitalia of the adult human female require no special preparation for the sexual act, and as a result there is no real periodicity nor any restriction in time in the performance of the sexual act. There is no recognizable estrus, no definite, regularly recurring period of sexual desire in the human female. Attempts to establish the contrary have been made, as you are all aware, but in women whose sexual feelings are sufficiently pronounced to admit of such an analysis the results are rather contradictory. In other words, the sexual or estrual cycle has in these species become faint or indecipherable. Nor is it essential to attempt to trace it out, for there is no clear evidence as to the existence of any causal connection between estrus and ovulation. I submit that the two cycles—sexual and repro-

ductive—are originally and essentially separate, and that the synchronism of estrus and ovulation is common in many species merely because it favors a high degree of fertility, and has therefore tended to become perpetuated by the process of natural selection. It is more important for us to concentrate our thoughts on the reproductive cycle, which in the human female, just as in the lower mammals, begins with the maturation of the ovum and its release in the act of ovulation, and continues with certain changes in the ovary and with changes in the uterus which may be summed up in the word “premenstrual,” *irrespective whether fertilization occurs or not*. The only difference in that respect is that if fertilization occurs, the cycle revolves through pregnancy to its allotted end. If fertilization does not take place, the cycle continues up to a point and then terminates prematurely. In other words, *in the absence of fertilization, a regularly recurring pseudopregnancy occurs, and its termination is the phenomenon that we call menstruation*.

Menstruation, on this theory therefore, is the end of a pseudopregnancy. It is not analogous to a preestrus and is essentially free from causal connection with any trace of an estrus cycle, which may be thought to be decipherable in human physiology. To my mind this theory is the most convincing that has yet been propounded, and it fits precisely the now established observations regarding the time of ovulation in relation to menstruation.

It may be noted in passing that the failure of a definite estrus to coincide in time with ovulation might be expected to diminish the probable fertility of the human species as compared with the lower mammals, in which such synchronization takes place, and this is undoubtedly true. To some extent it is counterbalanced by the fact that sexual intercourse is not restricted to a few definite periods in the year, and that the opportunities for impregnation are widely scattered. As a matter of fact, the regularly recurrent preparation of the uterus for impregnation, which occurs each month in the healthy adult woman, and which appears to follow each ovulation, provides for a reasonably high degree of fertility in most married women. If it were not so, the modern problem of birth control would not exist.

It is of interest to note also that the stimulus which leads to those changes in the uterus in preparation for pregnancy, which in the absence of fertilization take merely the form of this pseudopregnancy terminating in menstruation, arises in the ovary and not in the ovum. The truth of this is proved by the fact that pseudopregnancy may occur in the entire absence of ovulation or of an ovum, as for example if all the follicles in the ovaries have been destroyed experimentally by x-rays or otherwise. One great object indeed of this regularly recurring preparation for pregnancy on the part of the ovaries and uterus is to relieve the ovum of any responsibility for initiating these preparations.

The ovum is throughout its existence somewhat of a parasite. It receives lodging and board from the body of its mother and it gives nothing in return; and, after its liberation from the follicle, until, if fertilized, it becomes embedded in the decidua, it is in a position of almost complete independence of the mother, and is wholly occupied with the self-importance of its own destiny. Apart, therefore, from the fact that the time interval would be too short for adequate preparations to be made if they were begun only after fertilization had occurred, we cannot imagine the ovum undertaking the function of sending a hormonal message to the uterus to say that it had been fertilized, and would the uterus please prepare a bridal suite for its accommodation. Still less can we expect such a self-sufficient cell to send a message to say that it had been disappointed in its hope of fertilization, and that the uterus might cancel all preparations for its reception. On the contrary, all the evidence shows that it is the ovary which stimulates the uterine changes in the hope that the ovum, which it has just launched upon its career, will be fertilized; and it is the cessation of the ovarian stimulus in the absence of fertilization which leads to the uterine preparations being prematurely undone in the phenomenon of menstruation. May I elaborate this scientifically irreverent description in more correct terms?

The reproductive cycle begins in the ovary just prior to ovulation with the maturation of the follicle, and the formation in the whole ovary, not merely in the follicle nor merely in the ovarian stroma, of an ovarian hormone now usually spoken of as estrin. In this country attention has been focused on this hormone through the work of Allen and Doisy and others, and there is more than a tendency in the literature to refer to it as "the" ovarian hormone, as if it were the one and only such extract. There has been a great deal of work done which threw doubt upon such a conclusion, and the work of Wiesner and Patel,¹ in Edinburgh, and independently that of Corner, in America, have now established that there is at least one other ovarian hormone. Therefore, to this estrin hormone I shall, following Wiesner, apply the noncommittal term of "Alpha." Alpha stimulates estrus in lower mammals and in women produces uterine congestion.

As soon as ovulation has occurred, lutein tissue becomes formed in some quantity; and shortly thereafter a second ovarian hormone, which Wiesner calls "Beta," is elaborated by it. This second hormone, which is formed by the lutein tissue and which Wiesner and Patel claim actually to have isolated, stimulates and governs the preparations in the uterus for the nidation and gestation of the fertilized ovum—causes, in other words, what we know as the premenstrual changes. If fertilization occurs and the little blastocyst embeds itself in the sensitized endometrium, which we now call the decidua, the continued formation of beta by the corpus luteum governs the further develop-

ment of the uterus throughout at least the early months of pregnancy—a point which was first indicated by Fraenkel's great work a quarter of a century ago.

If, on the contrary, fertilization does not occur, the initial supply of the beta hormone formed by the corpus luteum soon becomes exhausted, and the preparatory changes in the uterus due to the action of and followed by beta, and which, as we have already seen, are really of the nature of a pseudopregnancy, come to an end and are broken down in the act of menstruation. Clinically, this is borne out by an observation which I have repeatedly made, and which has been reported by several gynecologists—namely, that if in operating on a woman in the latter half of the menstrual cycle, one removes the maturing corpus luteum, either by removal of the ovary, or by excision or mere expression of the corpus, menstruation infallibly follows within about thirty-six hours, even if it were not due for several days.

A question arises here as to what is the exact link of communication between the embedded ovum and the corpus luteum, which secures the maintenance of that body at full maturity for a considerable number of weeks and thus secures the necessary supply of the beta hormone. I submit that the link must be some hormone formed by the trophoblast of the young ovum, and that this, in all probability, stimulates the corpus luteum not only directly but through the medium of the anterior lobe of the pituitary body.

Now, one of the most interesting features of this recent work is its introduction of the anterior lobe of the pituitary body as an organ of primary importance. The idea of the general dependence of the ovary upon the pituitary body was originally noted by Frölich, and has been elaborated by Evans and Aschheim and other workers both in America and in Europe. It has been proved, for example, that extracts of the anterior lobe stimulate the formation of the corpus luteum and interrupt the periodicity of estrus in the lower mammals. But Crew and Wiesner,² in Edinburgh, have carried the investigation further and have demonstrated that the two phases of ovarian activity—what we may call the follicular or estrin or alpha phase, and the corpus luteum or beta phase—are due to the stimulus of two different pituitary hormones, which they have actually isolated from the anterior lobe. These they have designated rho I and rho II respectively. Further, they have produced evidence to prove that rho I induces the production of alpha or estrin in the whole ovary and leads to ovulation and to the formation of lutein tissue, but not to its functioning. Rho II activates the lutein tissue, which was brought into being by the stimulus of rho I, and so stimulates the formation of the beta hormone in the corpus luteum. As might be expected these rho factors can act only through the medium of an ovary. If injected into a castrated animal, they have no effect. On the other hand, the

ovarian hormones do produce changes even in castrated animals; alpha so injected produces estrus in the lower mammals, uterine congestion in woman; beta so injected produces in the uterus the changes of a pseudopregnancy, even in an oophorectomized animal.

Now we pass to what the old preachers would call the application of the doctrine, in other words, to a consideration of the possible implications or applications which the theory just stated may be expected to have upon our practice as obstetricians and gynecologists. Here we enter at once upon a realm in which speculation at present plays a larger rôle than observation; but such speculation is not without its value, provided it is guided by some degree of real knowledge. Speculation, so guided, is surely of the essence of that great process of induction, to which the progress of scientific thought and knowledge owe so much. It is for those of us who are practicing obstetricians and gynecologists to test this theory of the biologists by the assay of clinical observation and, it may be, in the crucible of clinical experimentation: to discard what we may find to be spurious metal, and to mint what we prove to be true into the accepted sterling of observed fact.

Beginning with obstetrics, the first point upon which our theory throws light is the diagnosis of early pregnancy. You will recall that the evidence points to a triangular relationship between the pituitary body, the ovary, and the uterus, particularly the pregnant uterus, containing the trophoblast of the young ovum. It was indicated that probably the trophoblast formed a hormone which stimulated the anterior lobe of the pituitary; that the pituitary in response emitted more of the rho II factor; that this in turn activated the lutein tissue in the corpus luteum of the ovary to the further formation of the beta ovarian hormone; and that this last governed the vascularity, the hypertrophy, and the other changes in the uterus, which are necessary for the safe continuance of pregnancy. Zondek and Aschheim have discovered that in early pregnancy a hormone from the anterior lobe of the pituitary is so freely formed in the mother's system, that it is actually present in the urine in recognizable quantity; and upon the basis of this observation they have elaborated what promises to be a very valuable and practical diagnostic test of the existence of early pregnancy. The test consists in injecting some of the urine into the bodies of young, immature female mice. If the anterior pituitary hormone, or as we may now in the light of Crew and Wiesner's work say, if the rho factors are present in sufficient quantity in the urine, the ovaries of the mice are tremendously stimulated and in the course of three days present clear evidence of precocious and intensive sexual maturity in the shape of great enlargement, follicular maturation, and—what is specific—the presence of hemorrhage in the follicles and of active formation of lutein tissue. This is a positive result, and the

experience of Zondek and Aschheim and of other observers goes to show that a positive result is practically never obtained unless a pregnancy exists in the woman from whom the urine was obtained. The experience of all who have investigated the value of this test goes to show that the margin of error is not more than some 2 per cent. The test, of course, can only be carried out where you have an observer with the necessary training and with the necessary supply of mice; otherwise it presents no great difficulty. By the kindness of my colleagues, Professor Crew and Dr. Wiesner in the Animal Breeding Research Department, we established in the University of Edinburgh in January, 1929, a Pregnancy Diagnosis Station, and by means of letters in the leading medical journals I was able to offer to the medical profession all over Great Britain and Ireland the opportunity of having urine tested in this way for a very modest fee, which only just covered the actual expenditure. The response has been very gratifying, and is of itself an indication of the real need for a reliable test of early pregnancy. Our work, it will be noted, has not been aimed so much at testing the specificity of the reaction, as at trying it out as a practical addition to our diagnostic methods, although one which is admittedly subject to a very small margin of error. In regard to the question of specificity, the experience of Zondek and Aschheim, of Brühl, and of others, suggests that occasional positive reactions may be obtained in cases of newgrowths, particularly malignant growths, and in inflammatory conditions, such as cystitis or vaginitis. In view of the well-known association of the pituitary gland with somatic and skeletal growth, this observation is interesting. Positive reactions have been obtained in pregnancy as early as thirty days after the last menstruation. Negative results in spite of the existence of pregnancy are more common in the early weeks than after the fourth month; and probably many cases in which a negative result is believed to be erroneous might be rectified by a second test. Tubal pregnancies give a positive reaction in the majority of cases, but not in old-standing cases of tubal mole, in which the trophoblast is largely destroyed or degenerated. Hydatidiform mole gives, as might be expected from the excess of trophoblastic epithelium present, a strongly positive result even with unusually small quantities of urine. Chorion-epithelioma, according to Zondek and Aschheim, gives a positive reaction.

The results of our work in Edinburgh show the practical value of the test in an entirely unselected series of cases in which pregnancy was suspected. Between January and July, 1929, we received from all over Great Britain and Ireland 360 specimens of urine. Two months after the result was notified to the doctor, a letter was sent asking whether the subsequent clinical course of the case confirmed the result of the test or otherwise. Up to the end of August we had re-

ceived 152 such replies. Fifty-seven results were negative, 90 were positive, and in 5 we were in error. Of these 5 errors—in 1 instance a repetition of the test, a month later, revealed the true state of affairs. In another the history given us was such that although the doctor said we were wrong, I have my doubts and would like to hear from him in another six months. But at the worst our error was apparently 3.3 per cent and I am rather inclined to think it should really be read as 2 or 2.5 per cent.

I would like to refer in detail only to one erroneous result which occurred in connection with my own private practice because it illustrates what I may call the irony of fate. The patient was a woman thirty-seven years old, on whom I operated in March, 1927. She had then had two children and two miscarriages which were attributed to myocardial disease. For more than a year she had suffered constant pain from a very tender, enlarged left ovary, which would have been removed earlier but for the serious condition of her heart. When she was sent to me, her heart had improved; and I operated and removed the diseased left ovary and tube. I also—and this is the first point—"sterilized" her by resecting three-quarters of an inch of the remaining tube at the uterine end and burying the stumps between the layers of the broad ligaments. Twenty-six months later she missed a period. Examination showed a very slight enlargement of the uterus, but there were no subjective symptoms of pregnancy. I was disposed to scout the possibility of a pregnancy, but obtained a specimen of urine for the test. The test was made forty days after the last menstruation, and was definitely negative. Fifteen days later she aborted and expelled what her doctor thought was approximately an eight weeks' embryo.

The duration of pregnancy and the cause of the onset of labor are two other obscure problems upon which I think these new researches shed some light. It is now generally accepted that, as was first indicated by Fraenkel, the continuance of pregnancy in the early months depends upon the presence and functioning of the corpus luteum. The work of Crew and Wiesner enables us to assert that it is dependent upon the formation of the beta hormone by that body; and as the activity of the lutein cells appears to be stimulated by the rho II factor from the anterior lobe of the pituitary, we can trace the responsibility for the duration of pregnancy back to the pituitary gland. But having done so, we find, as is so often the case in the complex functions of the human organism, that the trail can be pursued round in a curve to a point near our starting place. For we saw previously that there was some ground for supposing—or at least speculating—that the activity of the anterior lobe of the pituitary was maintained by the stimulus of a hormone formed by the trophoblast of the ovum. Thus, the circle completes itself; the safe continuance of the trophoblast in the uterus depends on the function of the corpus luteum: that in turn depends on the function of the anterior pituitary lobe: and that again depends, or may be found to depend, on the functioning of the trophoblast.

Now, if some such circular mechanism is found to be the correct explanation of the duration of pregnancy, it is obvious that the circle must be broken somewhere in order to interrupt the continuance of pregnancy. On this point I venture to throw out the suggestion that possibly the break is brought about by the gradually increasing senile changes in the trophoblast of the ovum. These changes are familiar to us all: the disappearance of Langhans' cells about midterm, and the gradual thinning out of the syncytium and latterly the degenerative changes which occur in it toward term. Such changes may well bring it about that the trophoblast in the later weeks ceases progressively to give the anterior pituitary lobe the requisite stimulus to the formation of the rho II factor (or ceases to produce the rho II factor itself), and thus lead directly to a shortage in the beta hormone of the corpus luteum. If further research should prove the correctness of this speculation, it will be another instance of how modern research serves but to explain views which were held speculatively at a much earlier date; for it is thirty years since Eden made a somewhat similar suggestion, based upon his researches on placental infarcts. This speculative theory of mine has this point in its favor—that it brings the onset of labor into parallelism with the casting off of the menstrual decidua at the end of a pseudopregnancy, for, as we have seen, that also is apparently due to the cessation of the beta hormone of the corpus luteum. Admittedly and indeed probably this is not the whole story. The familiar action of the extract of the posterior lobe of the pituitary gland is such as to make it extremely likely that it will be found to have some rôle to play in the drama in connection with the uterine contractions of labor, and possibly also of menstruation. Furthermore, there is a degree of apparent antagonism between the actions of the alpha and beta ovarian hormones which suggests the possibility that they dominate the situation alternately, and that as the influence of the one wanes, so the dominance of the other waxes greater. Wiesner has succeeded in producing abortion in the early weeks of pregnancy in experimental animals by the injection of alpha or estrin. I have tried by the same means to interrupt pregnancy in the human subject in normal cases near full term, and in others in whom the premature interruption of pregnancy was therapeutically indicated, and I have failed.

The problem of abortions, which occur without recognizable cause, is in some degree covered by what has just been said. Ever since Fraenkel pointed out the necessity of the corpus luteum for the safe continuance of pregnancy at least in the early months, efforts have been made to treat cases of threatened abortion and more particularly of habitual abortion by the administration of extract of the corpus luteum. We may now legitimately conclude that some of these cases are due to the inadequate supply of beta hormone from the

corpus luteum; and that failure may possibly be traceable to insufficient rho II from the pituitary. Pure speculation might even carry us one step further and propound the question whether the failure of the pituitary might not in its turn be due to the trophoblast of the young ovum not giving rise to the necessary stimulation of the pituitary. but without going so far as that, it is obviously rational to hope that the future may reveal a fruitful line of treatment either by the injection of the beta hormone of the corpus luteum, or possibly by the stimulation of the pituitary body or the injection of extracts containing the rho II factor.

I have referred to the fact that Zondek and Asehheim have found that in cases of hydatidiform mole the rho factors are present in excess in the urine; and I have ventured to link that observation with the excess of trophoblast present in that condition. It has another bearing of interest, namely, that the excess of the rho factors may well be the explanation of the lutein cysts which are so often found in the ovaries of women who have a hydatidiform mole. Lastly, Asehheim found that the urine of a woman with chorionepithelioma gave a positive reaction to the Zondek-Asehheim test, and has made the valuable suggestion that after a hydatidiform mole the urine of the woman should be tested from time to time, as any growth of retained fragments of trophoblastic epithelium might well be expected to reveal itself in a positive reaction. This strikes me as a very valuable diagnostic hint in regard to a condition of the greatest gravity.

I pass now to a brief consideration of the possible implications of this new view of the cause of menstruation upon the disorders of that function. The discovery and isolation of the alpha or estrin hormone of the ovary has led to its production commercially and to its widespread employment in *amenorrhoea*, but I have not seen any scientific records of its having proved a success in so far, at least, as primary amenorrhoea is concerned. I have tested it out in my ward in several cases of young women from seventeen to twenty years old, who had never menstruated, and in whom careful examination revealed no anatomic defect in uterus or ovaries; and I have used both commercial extracts and extracts supplied to me by Wiesner, which were, as tested in mice, vastly more potent than any product upon the market. The results have been disappointing in the sense that menstruation has not been produced; but, on the other hand, we must ask ourselves if there was any real reason to expect that menstruation would follow. For menstruation is the termination of a pseudopregnancy, and for the full development of that phenomenon both the alpha and the beta hormones are needed. What did happen in my cases, which were carefully watched over periods of several months, vaginal smears being made every second day, was that the injection of alpha (estrin)

produced some degree of cornification of the vaginal epithelium—an estrual change, be it noted, and not one associated with pseudopregnancy or menstruation—and that in one or two instances there was a little blood in the cervical mucus. In other words, the alpha or estrin injection produced an artificial or pseudoestrus in these patients, but nothing of the nature of a real menstruation. I hope in the future to be able to repeat these clinical experiments, using not only alpha, but following it up with beta, along the lines which this new physiology indicates.

In one or two cases of secondary amenorrhea, not due to any recognizable medical condition, I have achieved a modified degree of success with alpha, which suggests that it may occasionally succeed in starting the mechanism in an ovary which is functionally inert. But unless the injections are repeated monthly, the function ceases, and this indicates a very important principle; namely, that the hormone is apparently substitutive only and not stimulative in its effects; that is to say, that it may for the moment take the place of the normal product, but does not really stimulate the ovary to resume its own production.

Another method of treatment which is being tested at various centers, and which is closely linked up with the new physiology, is the stimulative irradiation of the pituitary body by x-rays. This seems a natural enough method, but most assuredly it is not one to be indiscriminately employed, for the effects of the rays once applied are beyond recall, and the slightest overdose may do far more harm than good. Moreover, it must be borne in mind that our new physiology teaches us that the pituitary body, the rho I and the rho II factors, cannot act in the way desired except through ovaries capable of reacting in the production of the alpha and beta hormones, and Wiesner has found that in the lower mammals the capacity to react varies enormously in the ovaries of different individual animals, and even in sister animals of the same litter.

The conclusion of the whole matter would therefore appear to be that the cause of amenorrhea is a very complex affair, and that its cure will have to be something that will activate the whole triangular mechanism of the pituitary, the ovary, and the uterus.

With regard to menorrhagia I propose to say very little. It is too vast and too complex a topic. I would merely point out that it has long been held on clinical grounds that some cases of excessive menstrual flow from uteri which presented no gross pathologic change were attributable to excessive ovarian action, and have even been treated successfully by removal of part of the ovaries. In the light of our present knowledge this observation may be interpreted as an excess of alpha or estrin which, when injected in large doses into

experimental animals, produces an intense and abnormally prolonged congestion of the uterus. This in turn is presumably due to an excess of the rho I factor from the anterior pituitary lobe. Quite possibly future research may enable us to complete a vicious circle in this connection, and to link up the excessive action of the pituitary to the condition of the endometrium; but of that I have no present evidence.

Dysmenorrhea of the true or intrinsic type, due to uterine colic, may be regarded as the pains of a spurious labor terminating the pseudo-pregnancy. But such a conception does not at present seem to lead us much further in regard to treatment. Beckwith Whitehouse has suggested, and brought forward some evidence to show, that dysmenorrhea is due to difficulty in the disintegration of the surface layers of the menstrual decidua. He believes that the transient exacerbations of the pain, which are so characteristic, are associated with the passage of abnormally large flakes of endometrium, and that what is usually called "membranous dysmenorrhoea" is really just an extreme form of the process which causes the pain in the more ordinary cases. I have repeated Whitehouse's observations in detail on several cases in my own wards, but have been unable to confirm them. Nevertheless his views are suggestive, and one can speculate that for the easy and painless disintegration of the menstrual decidua into such small cellular fragments as could painlessly pass through a possibly stenosed cervical canal, a nice adjustment would be required in regard to the supply of the beta hormone, which produces the premenstrual changes, and in the time of its cessation of action; and that a disharmony in this mechanism might be responsible for the clinical phenomena of dysmenorrhoea. Again, however, all that is purely speculative at present and is probably not the whole story. I refer to it merely in order to throw out a hint as to further lines of clinical research.

Lastly, may I just touch on one other baffling problem, namely, sterility. It is well known that some cases of sterility, for example, in cows, are due to a persistent corpus luteum, and may be successfully treated by the manual expression of the corpus luteum by the hand in the rectum. We have no actual proof that such a condition occurs in women, but some cases of female sterility associated with amenorrhoea may be susceptible of such an explanation, and, if so, the condition is presumably due to excessive or uninterrupted secretion of rho II by the pituitary. More difficult are the cases where the woman menstruates regularly and no cause can be found in either partner to the marriage for the failure to conceive. My old master and predecessor, Sir Halliday Croom, held that some of these cases were instances of monthly abortions. Now that we know the essential rôle played by the rho II hormone from the pituitary and the beta hormone from the corpus luteum in the preparation of a proper nidus for the fertilized ovum in the uterus, it is possible to speculate that

too little rho II and consequently too little beta may make the preparatory changes in the uterus so inadequate that although a fertilized ovum is there, yet it is unable to embed itself securely; and that in such cases menstruation is not merely the abortion of an unfertilized ovum, but of a fertilized ovum.

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THE TIME OF OVULATION IN THE MENSTRUAL CYCLE AS CHECKED BY THE RECOVERY OF OVA FROM THE FALLOPIAN TUBES

BY Q. U. NEWELL, M.D., ST. LOUIS, MO., EDGAR ALLEN, PH.D.,
COLUMBIA, MO., J. P. PRATT, M.D., DETROIT, MICH., AND
L. J. BLAND, COLUMBIA, MO.

(From the Department of Gynecology, Washington University Medical School and Barnes Hospital; the Department of Anatomy, University of Missouri School of Medicine; and the Department of Surgery, Gynecology and Obstetrics, Henry Ford Hospital)

HERETOFORE the time of ovulation in the menstrual cycle has been computed chiefly from studies of recent corpora lutea; i.e., the remnants of mature graafian follicles after the ova have been extruded. Very little is known about the human ovum from just before the time of ovulation until the embryo has implanted in the uterus. We are unable to find in the literature work describing the recovery and definite identification of a normal human ovum from the fallopian tubes. There is mention of such a possibility by Letheby,¹ Hyrtl,² Hoehne,³ Poten,⁴ and Gassman.⁵ After a critical study of the cases reported by these investigators we are inclined to doubt if their specimens were unfertilized tubal ova. A full discussion of these specimens will be found in a detailed report now in press.⁶ Corner⁷ and Allen⁸ have recovered unfertilized ova from the tubes of monkeys. This success suggested a similar possibility in women which would supply definite evidence concerning the time of ovulation in the menstrual cycle.

Until a few years ago it was thought that ovulation and menstruation occurred simultaneously, but from recent studies of corpora lutea in women, Schröder⁹ and others have concluded that ovulation takes place during the intermenstrum, probably from the fourteenth to the sixteenth day of the menstrual cycle. In the present work we have correlated the menstrual history in women with careful gross and microscopic observations of the corpus luteum and have attempted the recovery of the corresponding ovum from the fallopian tube.^{10, 11}

The main part of the work consisted of operating upon patients on different days of the menstrual cycle and, in cases where the ovum had been extruded, irrigating the fallopian tubes. Then the most recent corpus luteum was removed for histologic study and for quantitative analysis of hormone content by injections or implants into ovariectomized rats. In those cases in which it was not necessary to remove the fallopian tubes, they were irrigated with normal saline solution by a special technic of clamping the lower segment of the uterus with special uterine forceps, the tips of which were covered with rubber tubing so as not to injure the uterus, injecting about 20 c.c. of the solution into the uterine cavity through the wall of the fundus with a syringe and small caliber needle while the assistant with thumb and forefinger compressed the opposite tube at the uterine end as the other tube was being irrigated. The washings were collected in several small watch glasses and carefully searched for ova. This irrigation method is also useful in testing the patency of the tubes when the abdomen is opened. A detailed description of the technic with a drawing of the necessary instruments will be published later. In cases where the tubes were removed they were irrigated separately from either the uterine or fimbriated end. Where possible, ova were fixed, embedded in paraffin and sectioned for cytologic study. This is necessary for definite identification of tubal ova when they are surrounded by follicle cells, for one often finds small masses or balls of cells which are sometimes difficult to distinguish from ova.

The material has been selected from routine operations. Therefore, the amount of suitable material was greatly limited. In many of the cases operated upon, the pathology involving the pelvic organs was so extensive that the material was unfit for study. The best specimens were obtained from cases of myoma uncomplicated by pelvic inflammatory disease or cystic ovarian formations. In a few patients who were approaching the menopause, it was necessary to remove the uterus, and both tubes and ovaries. Also in cases of retrodisplacement in young women where no pelvic inflammatory disease existed to cause obstruction of the tubes, the tubes were irrigated in situ, the washings collected from the fimbriated extremity of each tube in a series of watch glasses and carefully searched for ova. Among the pathologic conditions encountered were closed fimbriae of the tubes due to old peritonitis or pelvic cellulitis, or the patient had had a previous attack of appendicitis and the tubes had been sealed (club ends). Many of the myoma cases were in negroes and adhesions throughout the pelvis were common. In some cases in which recent ovulation had occurred the sealed ends of the tubes made the passage of the ovum into the uterus impossible. Another obstacle of great importance that we encountered was the timing of the operation according to menstruation. It is surprising how few women keep accurate data pertaining to their

menstrual periods. This resulted in many cases that were suitable for study but had not recently ovulated. Also we had to consider possible irregular ovulation due to such conditions as occupational interferences, shock, constitutional diseases, or possibly marital relations. When all these factors are considered the search for tubal ova is difficult and often very disappointing and requires considerable patience and persistence to carry on the work.

In cases where the ovaries were removed it was easy to obtain the most recent corpus luteum. In cases where the ovaries did not warrant removal, as in cases where the tubes were irrigated in situ, the most recent corpus luteum alone was removed from the ovary. The stage of development of the corpus luteum was studied histologically in each case.

More than ninety operations were performed at various stages of the menstrual cycle. The greatest number of operations were performed between the twelfth and sixteenth day of the menstrual cycle (dated from the first day of previous menses), others ranged from the first to the twenty-fifth day. The most suitable material was obtained at operations occurring near the middle of the cycle (intermenstrum). From the above number of operations, nine specimens were recovered from the fallopian tubes which at first examination while fresh in saline solution were thought to be ova. Five of these were definitely identified after sectioning as tubal ova. One, on section, proved to be a "cell ball." It is possible that three specimens were degenerating ova, but definite identification after sectioning was not successfully accomplished. The common occurrence of "cell balls" in washings from the tubes increases the possibility of error in identification unless the specimens are sectioned. The so-called "cell balls," if not degenerating ova, may be clumps of cells originating from the peritoneal cavity or the fimbria of the tube or may be derived from the endometrium of the uterine cavity and forced out through the tubes in the process of irrigating the uterine cavity and tubes.

Corpora lutea showing fairly recent rupture points, as judged by gross examination of the ovaries at operation, occurred in more than 30 cases. Although upon a gross examination some of these corpora lutea appeared to be recent, on histologic examination a few proved to be fairly well developed. There were at least 16 cases which from a microscopic study of the corpus luteum, might have had an ovum in the corresponding tube. From these only five specimens which could be identified with certainty as ova were obtained. Of course involvement of pathologic conditions would lower the expectancy. Several promising cases had to be excluded because of adhesions of the ovary or occluded fimbriated ends of tubes due to old inflammatory disease.

Of the five specimens definitely identified as tubal ova, the first was recovered on the fifteenth day of the menstrual cycle (after onset of

the previous menses). The operation was for retrodisplacement of the uterus. A Gilliam-Crossen shortening of the round ligaments was performed. The tubes were irrigated in situ. A recent corpus luteum was resected from the right ovary. The second and third ova were twins recovered on the fifteenth day of the menstrual cycle. The operation was for myoma of the uterus. Supravaginal hysterectomy with double salpingo-oophorectomy was performed. Each ovary contained a corpus luteum with recent rupture point. Both tubes were dissected free from the myoma and washed out and an ovum was recovered from each tube. The ova were similar. The fourth ovum was recovered on the sixteenth day of the menstrual cycle. The operation was for chronic subinvolution of the uterus, endometrial implants

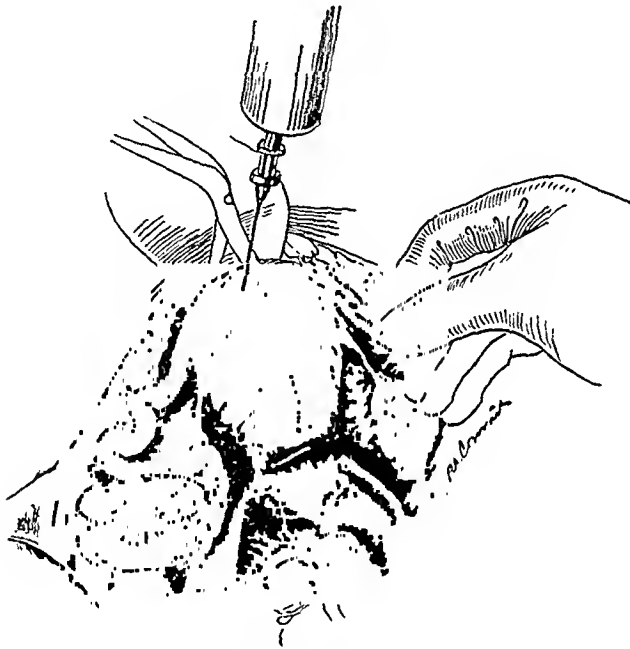


Fig. 1.—Drawing showing method of irrigating the fallopian tubes in search of ova. This method is also useful in testing the patency of the tubes when the abdomen is opened.

of the sacro-uterine ligaments and varicose veins of both broad ligaments. A complete hysterectomy with left salpingo-oophorectomy and appendectomy were performed. The tube was dissected free and washed out and an ovum recovered. The most recent corpus luteum was obtained in this case. The fifth ovum was recovered on the fourteenth day of the menstrual cycle. The operation was for chronic subinvolution of uterus and lacerated cervix. Hysterectomy with right salpingo-oophorectomy was performed, the recent corpus luteum being obtained from the ovary removed. The tube was irrigated and an ovum recovered.

Of the other specimens which were not identified with certainty as ova, one was recovered on the fifteenth day and two on the sixteenth

day of the menstrual cycle. A recent corpus luteum was found in each case. It is possible that these may have been degenerating ova but since definite identification was not successfully accomplished in sections it seems preferable to exclude these cases. The specimens mentioned here have been described fully in a publication now in press⁶ which should be referred to for details of cytologic description. In another paper¹² we stress especially the difficulty of timing the operation in regard to the menstrual history and the gross appearance of the ovary at operation.

From facts obtained from a study of the five unfertilized tubal ova, ovulation takes place on, or one or two days before, the fourteenth (morning of the fifteenth) day following the onset of the previous menses. It is, of course, possible that with the additional stimulus of intercourse ovulation might be induced at other times in the cycle. The time at which fertilization of the ovum takes place and the time during the menstrual cycle when a woman may be sterile is of considerable clinical importance. Apparently the ovum will have completely degenerated after the twenty-first day of the menstrual cycle and whether in the tube or the uterine cavity would probably be incapable of undergoing fertilization. From our data it seems probable that fertilization of the ovum takes place between the twelfth and fourteenth (morning of the fifteenth) day of the menstrual cycle. This does not mean that a woman must be exposed to intercourse only at that time to become pregnant. It has been shown that spermatozoa may live for some time in the female generative tract (the length of life depending on many factors) and no doubt in many instances the spermatozoa are lying in wait in the tube for the ovum when it is extruded so that it is fertilized soon after ovulation. If fertilization does not take place within a relatively short interval, the ovum undergoes rapid degeneration and there is little chance of conception until the next intermenstrum.

SUMMARY

1. More than 90 patients were operated upon and 9 specimens were recovered from the fallopian tubes, 5 of which were successfully sectioned and definitely identified as tubal ova.

2. A method of irrigating the tubes in situ was devised which we believe to be safe and which makes available cases where tubes showed no pathology and therefore were not to be removed. The method is useful to determine the patency of the tubes in cases of obstruction when the abdomen is open and plastic work has been done.

3. In this series of cases the time of ovulation was on, or one or two days before, the fourteenth (morning of the fifteenth) day following the onset of the previous menses.

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411 WALL BUILDING

 REPAIR OF COMPLETE PERINEAL LACERATION

BY G. D. ROYSTON, M.D., ST. LOUIS, MO.

(From the Department of Obstetrics and Gynecology of Washington University School of Medicine)

THE distress caused by complete perineal laceration is of much concern, both to patient and physician. Although this injury is seen perhaps less frequently than in former years, it is a possibility in every obstetric delivery. The small series of cases herein reported show eight complete tears following spontaneous delivery, four of which occurred in multiparae. The many varied attempts at repair is evidence of the lack of agreement in a method that is universally satisfactory. Phaneuf reports a series with few failures, but his excellent results are no doubt due to the unusual ability of the operator, since his was a one-man series.

The stimulation of useful constructive criticism of the various repair methods employed would seem to be of the greatest practical value to the operator of average ability. The majority of patients with complete perineal laceration are first treated by operators coming within this class.

With this hope, I have studied every patient operated upon for complete perineal laceration in Barnes Hospital and the new St. Louis Maternity Hospital. Three additional private patients operated upon in St. Luke's Hospital are included in this series, which comprises a total of 62 patients and 68 operations, performed by 13 different operators, all connected with the same teaching institution. The material is thus fairly representative and the nursing care fairly uniform in all cases, hence average results might be expected. All patients had tears through the sphincter ani and rectal wall which occurred during childbirth. Four of the patients were definitely syphilitic. Two of the patients were operated upon a second time, and two others had three operations following previous failures.

Different individuals have different means of arriving at the same end, and the technic employed by any particular operator doubtless gives better results in his hands than would obtain by his using methods commonly employed by others.

It is fully recognized that there are a large number of different factors that may influence the results obtained in repair operations, yet the *general average result* in such a study as this is significant. In order to try to evaluate some of the factors that might help or hinder a larger number of successful results, I shall show in tables the main differences in procedure.

Table I shows the forces concerned in etiology. It is interesting to note that among 62 patients in this series, complete perineal laceration followed spontaneous delivery eight times, of which four were in primiparous and four in multiparous labors.

TABLE I. COMPLETE PERINEAL TEARS, ETIOLOGY

	WHITE	COLORED	
Delivered by forceps	26	3	29
Delivered by breech	2	2	4
Delivered by version	3	1	4
Spontaneous delivery	7	1	8
Method of delivery not stated	16	1	17
Totals	54	8	62

Table II shows the results obtained in relation to suture material used in operation. There were 25 primary or immediate repair operations and 43 secondary or old repair operations. Results are classified as: 1. "Primary union with perfect function" when there was no visible wound moisture or slough of any degree whatsoever; 2. "Secondary union with perfect function" where perfect sphincter function and no visible leakage of any sort were present at time of discharge from the hospital, although any wound moisture, discharge or slough, however superficial, placed such a case as one with "secondary union." 3. "Secondary union with imperfect function" comprised all cases with any visible leakage or sphincter control less than perfect at the time of discharge from the hospital. Several of the cases so classed left the hospital with good sphincter control and a granulating recto-vaginal fistula, which may or may not have become fully closed later.

The final results following the use of linen and silk are better than I had expected from this very popular method. An operation which depends upon a certain amount of sloughing of sutures in a field so difficult to keep clean as the rectum, seems a good opportunity for a fistula. Among the 10 cases where silkworm stay sutures were used, 6 left the hospital with imperfect function and secondary union. This small series with 60 per cent failures would indicate the risk of using this type of suture. The chart also shows a better final result follow-

TABLE II. RESULTS OBTAINED IN RELATION TO SUTURE MATERIAL

	PRIMARY REPAIR	SECONDARY REPAIR	LINEN	SILK	SILKWORM		INTERRUPTED CATGUT				CONTINUOUS CATGUT		TOTAL OPERATIONS
					ALONE	STAY SUTURE	2-40	1-40	2-20	1-20	CATGUT		
											1-20	PLAIN	
Primary union Perfect function	12	13	4	4		1	3	2	7	1	3	7	25
Secondary union Perfect function	7	19	5	3	1	3	7	0	8	2	3	5	26
Secondary union Imperfect function	6	11	1	2		6	6	1	8	2			17
Total	25	43	10	9	1	10	16	3	23	5	6	12	68

ing the use of smaller and more quickly absorbable catgut with few knots than in the heavier varieties with interrupted sutures. This is shown most markedly in the 16 cases operated upon with the continuous catgut, No. 1-20 day or plain No. 1 or No. 0 catgut, with perfect final results in every case. No other type of operation in this series could equal this result and the method was employed by several different operators, hence, there could be no claim for superior technical skill.

Table III shows the results obtained in relation to the first defecation after operation. Among 6 patients with spontaneous defecation during the first four days after operation, 2 had primary union and 4 had secondary union with imperfect function, while not one of the 4 had a primary union where defecation during the same early period

TABLE III. RESULT IN RELATION TO FIRST POSTOPERATIVE DEFECACTION

DEFECACTION FROM	P. O. DAY	PRIMARY UNION, PERFECT FUNCTION	SECONDARY UNION, PERFECT FUNCTION	SECONDARY UNION, IMPERFECT FUNCTION	TOTAL
Spontaneous	1-4	2	0	4	6
	5-7	0	2	0	2
	8-10	0	0	0	0
	11-15	1	1	0	2
	16-23	0	0	0	0
Total		3	3	4	10
Enema	1-4	0	3	1	4
	5-7	3	3	1	7
	8-10	2	3	2	7
	11-15	2	2	3	7
	16-23	0	0	1	1
Total		7	11	8	26
Laxative	1-4	3	1	2	6
	5-7	2	1	1	4
	8-10	1	2	1	4
	11-15	9	7	0	16
	16-23	0	1	0	1
Total		15	17	4	31
Not recorded	1-4	0	0	1	1
Total		25	26	17	68

resulted from enema. The best results were obtained in twenty-seven with perfect function among 31 patients where defecation resulted solely from laxatives.

The postoperative diet was almost universally liquid, or liquids without milk, for seven days or longer. It is recommended that this latter diet be continued until after the wound is well united or symptoms of autointoxication occur. Such symptoms of autointoxication are: coated tongue, malaise, abdominal distention, dull headaches, possibly slight nausea, or slight rise in temperature. The laxative then recommended is mineral oil, 30 c.c., three times daily for two days, followed by a bottle of citrate of magnesia given in divided doses. The desirable time for the first defecation seems between eleven and

fifteen days after operation. In two cases the first defecation occurred twenty-three days after operation. Any local manipulation, whether from enema or rectal tube, would seem more likely to traumatize the wound, since among 26 patients where the first defecation resulted from the use of an enema only 7 of them had a primary union.

Table IV shows the result obtained in relation to preoperative preparation. "Routine preparation" means the customary liquid or soft diet and a laxative, with or without an enema, the day before operation, and an enema on the morning of operation. "Special preparation" embraces liquid diet, laxatives, and enemas for two successive days before operation, and an enema on the morning of operation. This "special preparation" makes it much easier to postpone the first defecation following operation. The figures show that the best results followed the latter; 11 out of 13 patients with perfect function as compared with only 20 out of 30 following "routine preparation." Comparison could only be made in the secondary operations, as all primary repairs were performed on patients who had had only the ordinary

TABLE IV. RESULTS OBTAINED IN RELATION TO PREOPERATIVE PREPARATION

	SECONDARY REPAIR	ROUTINE PREPARATION	SPECIAL PREPARATION
Primary union with perfect function	14	10	4
Secondary union with perfect function	17	10	7
Secondary union with imperfect function	12	10	2
Total	43	30	13

preparation for delivery, which included at most only a low enema, and, in a few cases, castor oil for induction purposes.

The method of repair preferred is shown on a primiparous patient where a midline episiotomy extended through into the rectum during delivery. A Doyen vaginal retractor and a Gelpi self-holding retractor are used to expose the wound without any crushing trauma with forceps. In secondary repairs, a deep silkworm suture is passed through each levator, as high up in the vagina as possible, before beginning any dissection. These silkworm sutures, clamped separately, are used only as halters to help identify the levators when beginning to suture same.

1. Closure of rectal wall by a continuous Lembert suture of No. 0 or No. 00 plain catgut, with a small curved needle on each end. The suture begins in the muscle *above* the apex of the tear and ends in the anal skin superficial to the sphincter ani.

2. The other end of the suture approximates the perirectal tissues over the first line of suture. Using a continuous Lembert suture the rectal wound is thus closed in two layers. No suture penetrates the rectal wall and there are no knots

buried or anywhere in contact with the rectum, the two ends of this suture being tied outside through the anal skin and constituting the lowermost perineal suture outside the skin, as indicated by arrows.

3. The rectal wound has been closed in two layers with ends shown not yet tied. The sphincter ani is now united by a deep suture through the inner third.

4. Two No. 1 plain catgut sutures, preferably mattress or simple interrupted sutures, are carried through the outer third of the sphincter ani and now approxi-

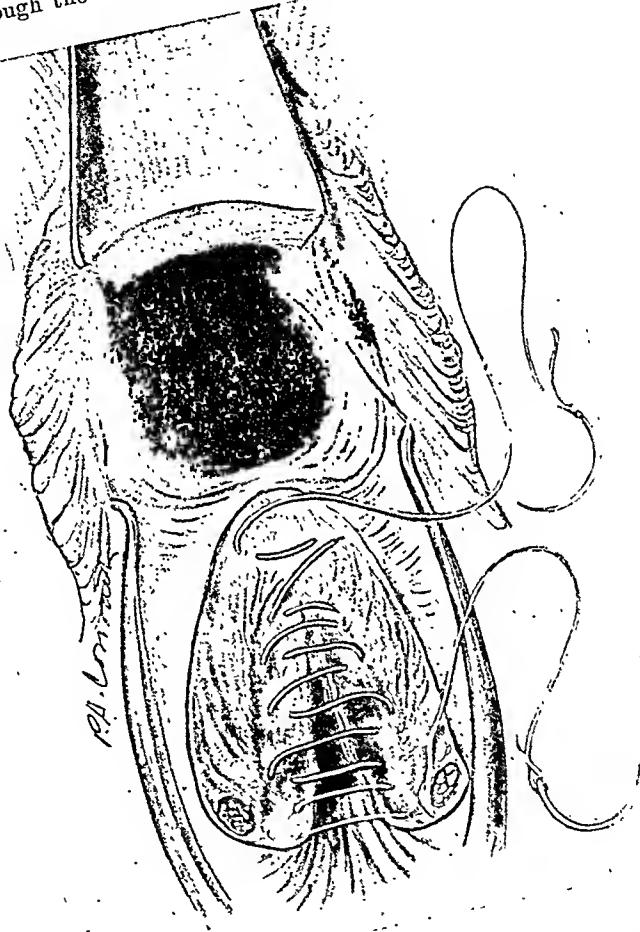


FIG. 1.

mate the margins of the latter. The knots are placed on opposite sides away from the line of union. Note the free ends of the sutures used to close the rectal wound.

5. A full length No. 1 plain catgut suture is introduced longitudinally deeply in one side of the muscular layer, parallel with the longitudinal direction of the vagina; it is then brought out and carried across the midline and inserted at a right angle to its previous direction, emerging immediately below the vaginal mucosa near the upper angle of the wound. This suture is laid aside upon the abdomen to be used as a superficial submucous closure. The other (deeper) end of the suture threaded is used to approximate the deeper muscular layers and is brought through the skin, as indicated by arrows, to form the second lowest suture tied on the skin surface.

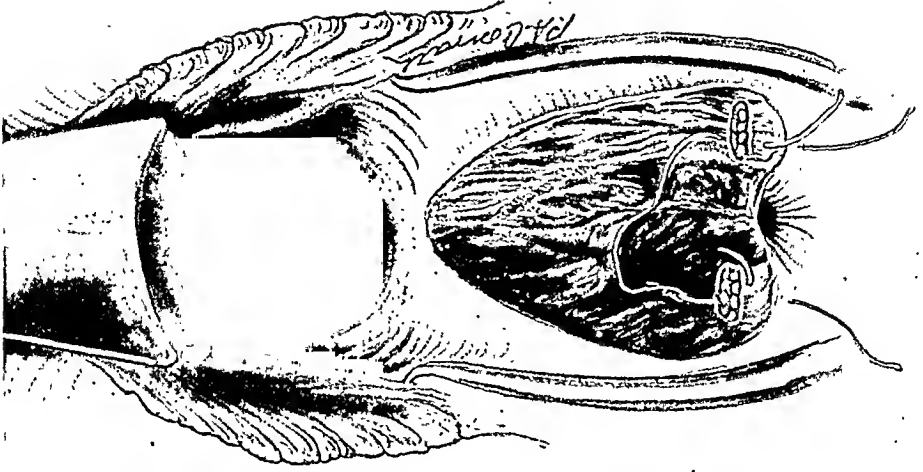


FIG. 3.

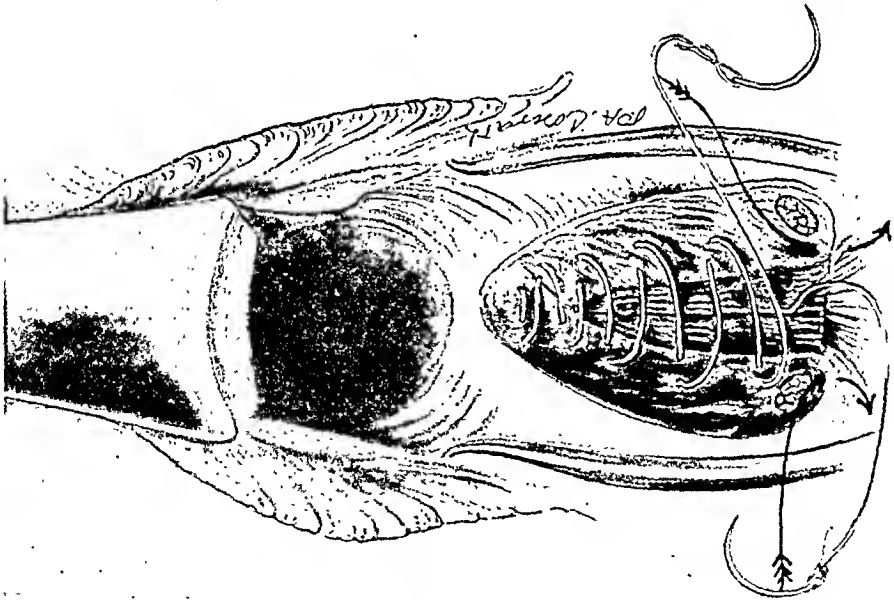


FIG. 2.

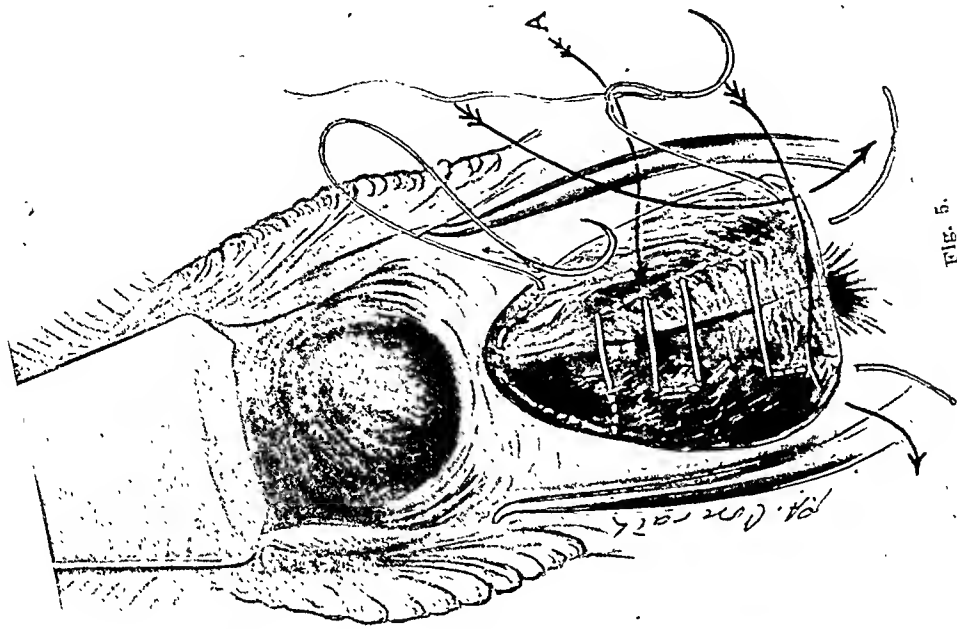


FIG. 5.

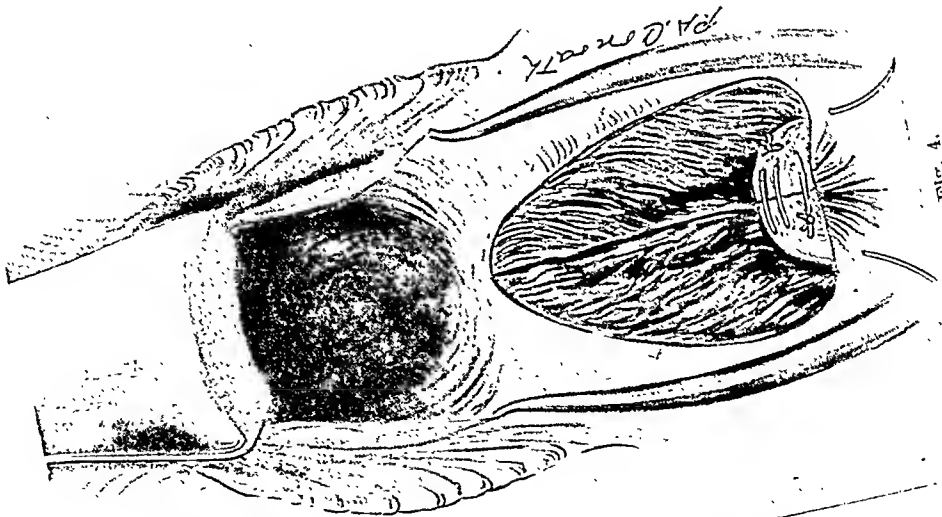


FIG. 4.

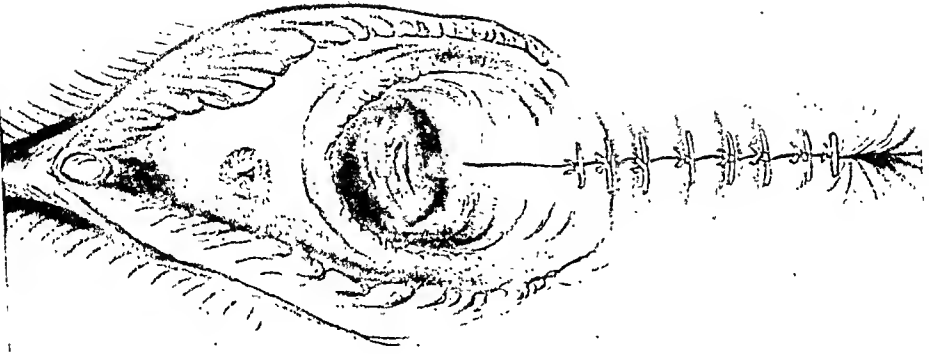


Fig. 7.

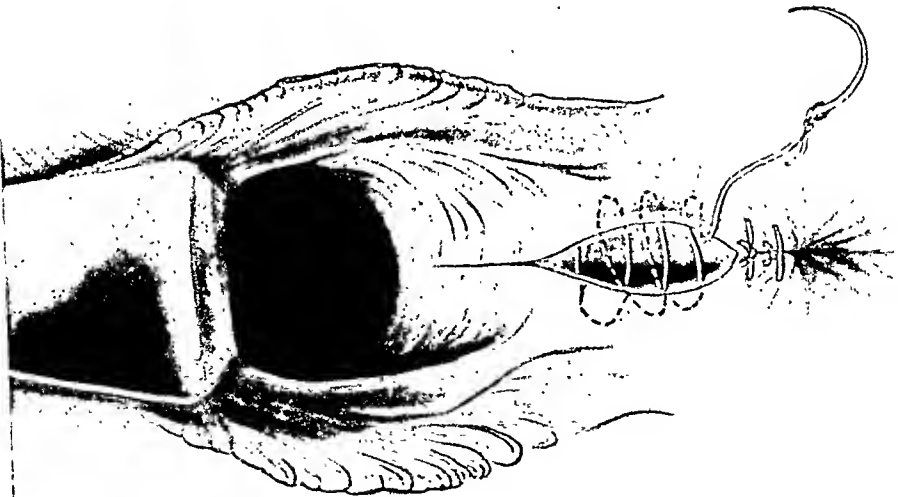


Fig. 6.

6. The continuous sutures described above have now been tied and the more superficial layer of continuous No. 1 plain catgut has approximated the vaginal wound by a submucous suture. This suture carried widely on either side at the mucocutaneous juncture closes the introitus and prevents gaping. The two or three deep muscular bites over the base of the perineal triangle from above down obliterates dead space and the suture is cut short without tying.

7. The skin wound is then closed with superficial sutures of No. 1 plain catgut, interrupted or continuous in primary repairs, but preferably interrupted in secondary repairs, with knots being more to one side of the line of repair than is shown in the picture.

All knots used in this operation are visible excepting the two or three knots approximating the sphincter.

It is recognized that this method of suture is too complicated to enjoy any widespread popularity. It requires an extra assistant in order to complete the operation as quickly as when using a simpler method. The advantages claimed are: A more complete approximation of the tissues, less pain to the patient, and lessened liability to pressure necrosis than by any other method that I have used.

SUMMARY AND CONCLUSIONS

Prophylaxis is, of course, first in importance. Among the prophylactic measures advised are:

1. Follow the normal mechanism of labor.
2. Iron out the pelvic floor slowly and gently with liquid soap prior to delivery. The lower position of the thighs during delivery, as recommended by Potter, is desirable.
3. Digital stretching of the sphincter *ani* before delivery in cases of suspected disproportion, narrow bony outlet, and especially in abnormal presentations, including breech deliveries.
4. The mediolateral incision in the perineum in such cases as those just mentioned and in primipara with low perineum (less than $1\frac{1}{2}$ inches high) where disproportion is suspected.

As curative measures, I would suggest the following aids in secondary repair:

1. Special preoperative preparation by diet and elimination for two successive days prior to operation in secondary cases.
2. Excision of all cicatricial tissue along line to be sutured.
3. Absolute freedom from tension along suture line of union (in this connection, dissection on each side of the rectum is of great value).
4. No suture anywhere within the rectal lumen.
5. No suture *knot* anywhere in contact with the rectal wall.
6. Use a small running (continuous) suture of No. 0 plain to No. 1-20 day chromic catgut throughout the entire operation, bearing in mind the principle of surgical pathology that if a primary union has not occurred within six or seven days after operation, there will be none, and that sutures lasting much longer than this time act as irritants and only too frequently cause pressure necrosis, especially at the site of knots.

7. Only a continuous Lembert suture of fine plain catgut is recommended for closing the rectum.

8. The same type of suture has given me equally good results in approximating the sphincter in primary repairs, although in secondary operations it is recommended that the sphincter ani be stretched prior to the denudation, as recommended in Crossen's *Operative Gynecology*, and then the ends sutured by the fewest number of interrupted sutures that will approximate same.

9. The use of all crushing instruments, or even the Allis forceps, is discouraged, a deep bite of the needle being equally effective and less traumatizing. Instrumentation should be reduced to the minimum.

10. Knots should be few in number and tied barely tightly enough to make contact of the sutured wound margins.

11. Postoperative diet of liquids without milk but including broths, gruels, fruit juices, etc., until signs or symptoms of autointoxication appear.

12. Opium derivatives enough to relieve pain and quiet peristalsis.

13. No pitcher or cleansing douches of any kind, the wound to be left untouched at all times, preferably without any vulval pad. Plass proved twelve or thirteen years ago that untreated repairs heal best. All of us know how much better results are obtained in out-patient repairs without postoperative tinkering than in the overtreated hospital cases.

14. Dry heat from electric light bulb or ice-cap in a sterile towel locally is permissible for pain.

15. Watch daily for marked edema and pressure necrosis from suture. At any time after third or fourth postoperative day, clip the suture if it threatens to cut.

16. If patient is unable to empty the bladder, keep in a retention catheter and irrigate the bladder daily until the repair wound causes no discomfort.

17. No enema or rectal tube at any time.

18. Ten to fifteen days following operation, six ounces of mineral oil in divided doses, followed by a bottle of citrate of magnesia insures a soft stool without the necessity of traumatizing manipulation.

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ROOSEVELT BUILDING.

THE EARLY DIAGNOSIS OF ACUTE INTESTINAL OBSTRUCTION

BY FRED M. DOUGLASS, M.D., TOLEDO, OHIO

THE purpose of this paper is to call your attention to a method which enables the diagnosis of acute postoperative intestinal obstruction to be made very early. This has been brought about by the careful study of 67 cases. I have excluded from this discussion acute obstructions due to cancer or volvulus, strangulated hernia, and mesenteric thrombosis. The cases considered are those occurring postoperatively and can be divided into two groups: first, those occurring during the patient's stay in the hospital, and second, acute intestinal obstruction developed after the patient has left the hospital.

In the first group, there were 37 cases with 41 operations and 12 deaths, the mortality being 32 per cent. In this group there were 9 cases of purulent peritonitis, and of this number there was but one recovery.

The accompanying tabulation shows the type of operation preceding the obstruction:

- After appendectomy, 18 cases, 6 deaths.
- After pelvic inflammatory disease, 8 cases, 5 deaths.
- After large twisted ovarian cyst, 4 cases, 1 death.
- After resection of bowel, 1 case, 1 death.
- After duodenal ulcer, 1 case, 0 death.
- After hernia, 2 cases, 0 death.
- After hysterectomy, 2 cases, 0 death.

In the second group there were 30 cases with 4 deaths, the mortality being 13 per cent. This offers a marked contrast with the above-mentioned group in which the mortality was 32 per cent. The argument might be advanced that this group contained cases more or less chronic in type, but careful investigation reveals that 18 of these patients entered the hospital within forty-eight hours after the beginning of the first symptoms and that the other 12 came into the hospital shortly after this forty-eight hour period.

In the reexamination of the records of the first group of cases, it is possible to obtain from the charts information which we believe would have made the outcome in this group much more favorable. I am of the opinion that the present signs and symptoms of acute intestinal obstruction as given in the literature and textbooks are found late in the disease.

In examination of a suspected case of postoperative intestinal obstruction, the surgeon must inquire first in regard to the type of pain

and discomfort from which the patient is suffering. The first symptom of intestinal obstruction is that of intensified abdominal pain, more or less localized. This is the type which is charted as "gas" pains but is distinctly different in that the pain is much more severe and colicky in nature. Intensification of gas pains occurred in 34 of the 37 cases and

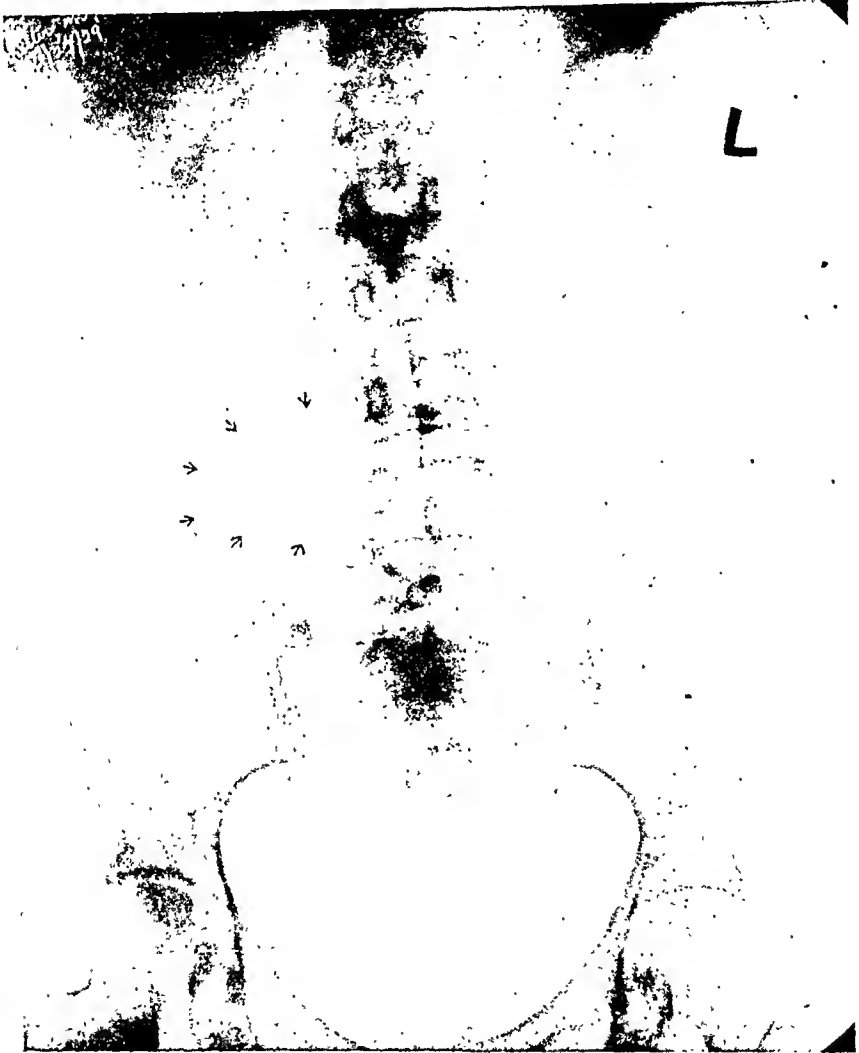


Fig. 1.—Partial obstruction of one loop, distended. The rest of the gas is in the large intestine. Distended loop is indicated by arrow.

was first noted from eight hours to five days before diagnosis of acute postoperative intestinal obstruction was made. Frequently the patient will state that she hears or feels rumbling of gas in the abdomen. Nausea is usually not present at this time, but may be. Vomiting at this stage in the disease seldom occurs. Hyperperistalsis is not seen until later. Upon inspection of the abdomen one notices but slight distention at this stage. Palpation, however, reveals a tenseness of the

abdomen. The distention, as ascertained by palpation, is much more constant than noted by inspection. Slight or moderate distention on palpation was found very early in 34 of the 37 cases. Auscultation in our hands has not been illuminating, but probably if done by Dr. King¹ would give further proof of obstruction at this stage.

Since the work of Case, we are able to confirm these clinical findings



Fig. 2.—Ladderlike arrangement showing herringbone markings found in late cases.

by means of x-ray examination of the abdomen. He called attention to the fact that roentgenograms of the abdomen will show distended loops of small bowel in early obstruction. Quoting from Dr. Case's² paper:

“Normally there is no gas in the small intestine, at least not in quantity sufficient to be recognized on the roentgenogram. In aerophagia and in certain stages of chronic small intestinal stasis not due to any organic obstruction, gas

found in the small bowel presents a characteristic appearance; numerous small, irregularly spaced gas areas, giving to the central portion of the abdominal shadow the reticulated or web-like aspect, which is in distinct contrast to the gastric and colonic gas collections. In acute small bowel obstruction the appearance of jejuno-ileal loops is very striking. Two types of bowel outline may be described: (1) a herringbone appearance due to the gas causing the folds of Kerkring to stand



Fig. 3.—Ladderlike distention of ileal loops, seventy-two hours after onset; obstruction of terminal ileum.

out by contrast, giving a feathery or slashed appearance to the intestinal loop; and (2) a ladder arrangement of the shadows of the bowel coils when the distended loops lie parallel. The latter appearance is pathognomonic of acute obstruction requiring immediate surgery.”

Dr. John T. Murphy, of Toledo, as early as 1924, was able to see, by means of the fluoroscope, distended small bowel in one case and confirmed our diagnosis of acute postoperative intestinal obstruction.

Since Dr. Case's work, we have observed the following cases and feel that the "herringbone" appearance comes late, as does also the "stepladder" arrangement, and the amount of distention of the bowel depends upon the amount of fluid and gas above the obstruction. We believe that a distended loop or two of small bowel in the presence of clinical signs completes the diagnosis.

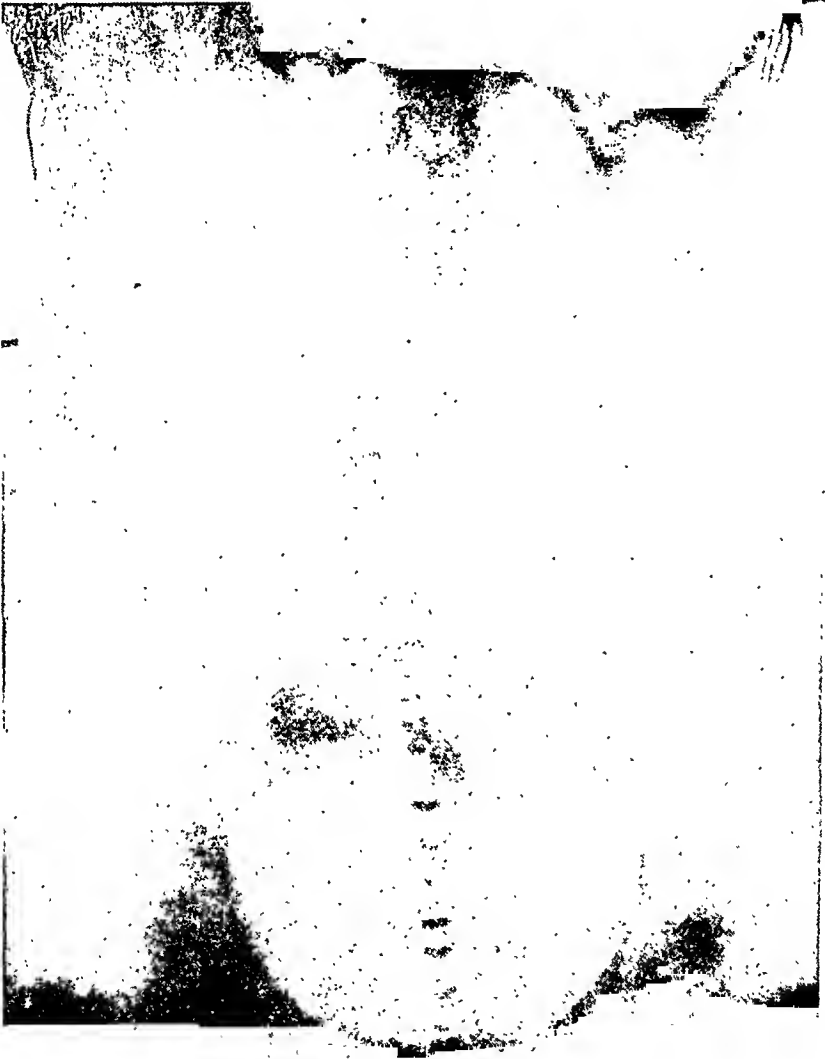


Fig. 4.—Marked distention of many loops, indicating obstruction of long standing. This is associated with peritonitis.

We are of the opinion that when patients are extremely sick and plates are made at the bedside with portable machines, the antero-posterior position may fail to show definite distended loops on a ladder-like arrangement which could be demonstrated by means of lateral plates or may be noted by one trained in observation of the cross-section of the bowel as seen in the anteroposterior position.

The treatment of acute intestinal obstruction in our hands is about the same as that employed by most men. We attempt to overcome obstruction early by freeing the bowel when possible and draining the obstructed intestine by ileostomy. The usual supportive measures, as the maintenance of high water intake and blood chloride level by the



Fig. 5.—Massive distention of only a few loops. Herringbone effect seventy-two hours after onset of symptoms.

use of saline intravenously and by the hypodermoclysis, are followed. Blood transfusion has been of value in many cases. Glucose is given along with the saline to combat acidosis. The duodenal tube is used early and frequently. Heat in large amount is applied to the abdomen and over the liver area. Perfringen's antitoxin has been used, but we are unable at the present time to state its value.

COMMENT

In acute intestinal obstruction there is a definite period when pain is present along with some distention of the abdomen. Such symptoms as vomiting and visible peristalsis of the abdomen are rarely seen

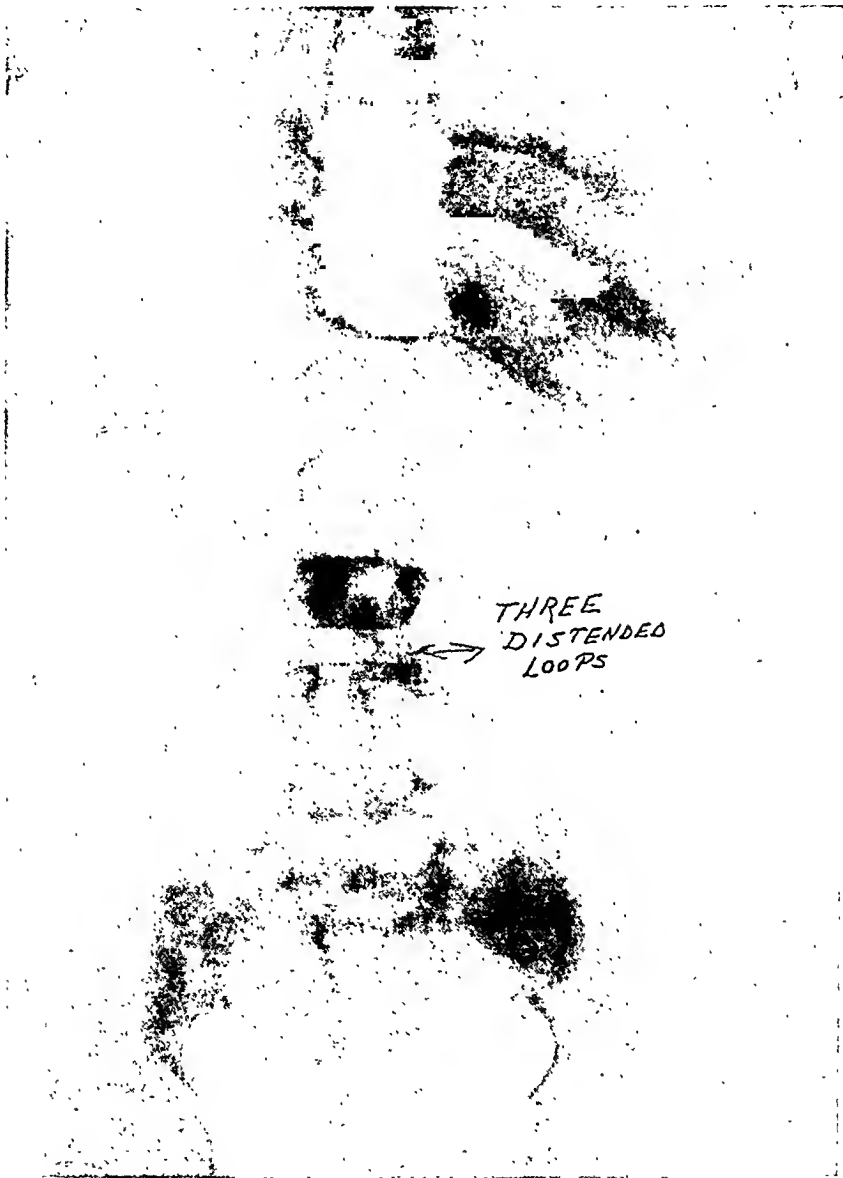


Fig. 6.—Onset of first pain at 4 A.M. X-ray at 9 A.M., or five hours later, showing the three distended loops.

this early. The chart of the patient will reveal that enemas are productive and the patient is passing gas; and at this time examination of the blood chlorides and nonprotein nitrogen is of little value, because the obstruction is so early. X-ray examination is very helpful as a

confirmatory measure; and, because of this, it should be done early in all cases of suspected intestinal obstruction.

CONCLUSION

The study of the case records has convinced us that the diagnosis of acute intestinal obstruction can be made much earlier than has been done in the past. The use of x-ray has confirmed our clinical suspicion and has made us operate upon patients with acute intestinal obstruction much earlier than we previously did. With this in mind, we feel sure that in the future our present mortality rate will be greatly reduced.

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421 MICHIGAN STREET.

THE PROTECTIVE RÔLE OF THE LIVER IN ABDOMINAL SURGERY

BY CHAS. GORDON HEYD, B.A., M.D., F.A.C.S., NEW YORK

(*Professor of Surgery, New York Postgraduate Medical School and Hospital*)

THE liver, approximately the same size and weight as the brain, is placed as a buffer between the portal and systemic circulations, and is interposed between the spleen and the heart. The liver receives the blood from practically the entire viscera of the abdomen, yet the amount of arterial blood supplied to it is very little, as the final divisions of the hepatic artery are small in proportion to the bulk of the gland. It is interesting to visualize the adequate arterial blood supply of the thyroid and the kidney, where the biochemical activity is an oxidation process as compared to that of the liver. The vital functions of the liver are practically carried on with only venous blood. The major portion of the blood that traverses the liver is venous, one-sixth to one-eighth of which represents splenic blood. This venous blood contains the by-products of splenic metabolism and the intermediate by-products of digestion.

According to Crile the liver has a marked thermogenic function, as one-third of the heat production of the body is due to liver activity. "When the temperature of the liver is reduced one degree, its chemical activity is reduced 10 per cent." Furthermore, a fall in the temperature of the liver is always preceded by a fall in brain temperature, and resistance to traumatic stimuli is manifest in the brain either before or simultaneously with its effect upon the liver. Renauld Capart states

that abdominal blood is essential for cerebral activity and the blood which has passed through the liver possesses in greatest degree the property of reestablishing cerebral function. There are two specialized types of cells in the liver; hepatic cells which are concerned with bile elaboration and stellate cells which have a specific function in the reticuloendothelial system. The latter cells are capable of removing bacteria from the circulating blood by phagocytosis.

In any laparotomy, with or without exposure of the liver, there are a great many possible physical, chemical, infectious, mechanical and toxic traumata, plus possible leakage from drainage, plus varying degrees of dehydration. The sum total of any or all of these surgical accompaniments may not necessarily be lethal to the ordinary, fairly normal surgical subject, but may often prove fatal to the handicapped patient or the patient with a depressed or an impaired liver competency.

The frequent association of hepatitis and abdominal disease has been amply demonstrated from both the clinical and pathologic aspects. Lesions of the liver may be unilateral and affect one half of the organ more than the other half. Cantile demonstrated that the liver is a bilateral and symmetrical organ with its morphologic center represented by the gall bladder fossa and with two sides of relatively equal weight. It is interesting to note that tropical abscess is almost invariably associated with the right side of the liver; the splenomegalias and gastric affections with the left side of the liver, while diabetes, when it is associated with liver pathology, almost invariably exhibits the hepatic change in the right lobe. Reidel drew attention to the fact that the lobe of the liver, which goes by his name, is confined to the right side, and Glenard states that Reidel's lobe was the direct result of inflammatory changes incident to gall bladder disease. Hess and Sergé attempted to segregate certain functions of the liver as being peculiar to either the right or left lobe. Glenard intimated that there was a difference in function between the right and left lobes and that the injection of staining fluid into various branches of the portal system was followed by unequal distribution throughout the liver, injections from the superior mesenteric vein showing a predilection for the right-sided distribution and that from the splenic vein predilection for the left side of the liver. Koffer demonstrated that the blood from the spleen, stomach, and major portion of the colon goes to the left lobe of the liver while the blood from the duodenum, head of pancreas, and jejunum goes to the right lobe of the liver. In other words, the by-products of alimentary absorption go to the right side of the liver, the products from colon and spleen go to the left side of the liver.

In carbohydrate metabolism the liver regulates quantitatively the amount of carbohydrate that is furnished to the body cells under the varying conditions of carbohydrate intake and bodily activity. According to Mann the normal blood-sugar level is maintained by the liver which adds glucose to the blood that passes through it. Furthermore, the liver concerns itself with protein metabolism in three ways: (1) deamination, (2) urea formation, and (3) uric acid destruction. If the liver is removed, deamination does not take place and urea is not produced, nor is uric acid destroyed. Obviously, if the liver, as

the result of abdominal trauma, loss of heat, portal infection or toxemia, or anesthesia, is impaired permanently or temporarily, in major or minor degree, then the glucose and protein function of the liver would be insufficiently maintained and we should reasonably expect postoperative complications of diverse types and varying degrees of gravity. In general, the deaths that occur after abdominal surgery are readily explicable on the basis of the pathologic condition found at operation, the type and the extent of the surgery performed, the preoperative condition of the patient, and the postoperative complications that ensue.

We are not concerned in this paper with postoperative mortalities that arise from cardiac failure, edema of the lungs, pneumonia, embolism, or sepsis. Death within the first twenty-four hours after an operation is not ordinarily due to sepsis but is the result of what we may call the mechanical factors of death: severe postoperative hemorrhage, acute gastric dilatation, shock, or leakage from intestinal anastomoses, etc. These lethal terminations are, as a rule, readily diagnosed and within a limited degree are preventable or respond to adequate therapy. The full development of a fatal sepsis ordinarily requires a variable interval of time between the implantation of the infection and its full development. The occasion even of an acute fulminating, diffuse peritonitis usually exhibits what may be spoken of as a "clear interval"; that is, a certain definite time between the completion of the surgery and the development of the fatal termination. This interval, of course, may vary with the type and virulence of the organism, with the resistance of the patient, and with the degree of surgical trauma. The interval is manifestly longer in gynecologic surgery; while it has a shorter and more rapid incidence in perforations of the intestinal viscera, in colon, gall bladder, or stomach surgery. Furthermore, the development of a secondary abscess at the peritoneal site of an operation requires a certain amount of time before its death-producing possibilities become apparent or alarming. When all of these possible factors in the production of postoperative mortality in abdominal surgery are eliminated, there still remains a significant group of deaths that are not due to anatomic causes, that are not due to infection, and that are not due to overwhelming intoxication of high intestinal obstruction or perforation. The clinical manifestations of these cases suggest that the mechanism of death is a chemical one and is in a large measure due to liver failure or to an insufficiency of the protective function usually exercised by the liver.

Opie has intimated that under the ordinary wear and tear conditions of life the colon group of bacteria exhibits slight pathogenicity for normal animals. If, however, the liver is injured by some metabolic disturbance or some form of toxemia, the liver then becomes un-

usually susceptible to colon bacillus infection. The combination of chronic toxemia with a recently acquired bacterial invasion not infrequently precipitates an acute necrosis of the liver. Under ordinary living conditions many patients have sufficient liver function to maintain a certain degree of bodily welfare and activity. When this is interrupted by a surgical operation, or there is thrown upon an already compromised liver the increased burden of detoxifying a further increment of deleterious products, the liver is unable to do so; and the interim between operation and death represents the period of increasing and progressive exhaustion of liver capacity. The liver is notoriously able to control infectious and catabolic proteins that are the result of infection. If the dosage of these offending bodies is so great as to overwhelm the liver, or their toxicity is beyond the detoxifying power of the liver, it is a question only of time before the liver fails to give that protection which, under ordinary circumstances and even in the presence of a chronic abdominal condition, it has been competent to render up to this time. A little reflection will show that the individuals who die as a result of surgical intervention for malignancy present, as a rule, a different prelethal appearance than do the patients who are operated upon for long continued sepsis. Long continued sepsis, either within or without the abdomen, is characterized by a progressive physical deterioration. For an indefinite period the natural protective and chemical processes of the body hold the infectious process and the products of infection in check and may often bring about an abatement of the systemic injury; but with added years there comes a failure of the protective mechanism, and the injury of chronic sepsis is thrown upon the cardiovascular system, the muscles and tendon insertions, the peripheral nerves, and finally upon kidney and liver. In all these years of slight, trivial but accumulative septic injury, the liver is one of the chief organs of defense.

Jaundice after pelvic operations and in the presence of ectopic gestation is neither rare nor unusual and septic pyelophlebitis occurs after pelvic surgery as it does in the wider field of general abdominal surgery. The absorption of any great amount of wound serum means an increased burden on the part of the liver. Wound serum is essentially protein material which must be metabolized by the liver after absorption. In all laparotomies there are varying degrees of peritoneal denudation and particularly after certain pelvic operations. In all these cases there is peritoneal transudation and some wound secretion. Drainage is indicated in these cases, not alone to prevent the development of sepsis but also to allow for external drainage of the accumulated wound secretions which might otherwise embarrass an already overburdened liver. Experimentally, it has been demonstrated that the injection into the circulation of the secretion from any large intra-

peritoneal wound is injurious to the hepatic parenchyma and the effect of such injections can be chemically estimated by a decreased output of bile acids and bile salts.

There are certain types of chemical deaths that are fairly well understood, the coma of diabetes, uremia and cholemia. But, how can one account for the deaths that occur in this manner? A patient, thirty-seven years of age, in apparently good physical condition, has 4,200,000 red cells, 78 per cent hemoglobin, 12,000 leucocytes, 78 per cent polynuclears, negative Wassermann, and normal phthalein test for kidney function. There is a blood pressure of 130 over 80, and a normal intestinal function. For a period of three years the patient has been complaining of pain in the upper abdomen, coming on at irregular intervals, usually after meals, relieved by bicarbonate of soda, and by vomiting. She has had one attack of pain requiring a hypodermic of morphine. The physical examination suggests gall bladder pathology, and a gastrointestinal x-ray series with a dye test confirms it. This patient is operated upon at nine o'clock in the morning. A simple cholecystectomy is performed; the common duct is not involved and the appendix is not noteworthy. The remainder of the abdomen is without any obvious pathology. The liver, however, shows macroscopically a slight enlargement. The edges are crenated. The consistency is leathery. In the area of the gall bladder is a white fibrous rosette-like tissue, radiating from the gall bladder area. The extent of this fibrous tissue diminishes with the distance from the gall bladder zone. Over the superior surface of the right lobe of the liver, but not over the left lobe, is a continuation of this fibrous tissue trabeculation. The operation is terminated in about three-quarters of an hour. The anesthesia has been given with care and caution. Following the operation the patient does not completely come out of her anesthetic but late that afternoon seems to be more dull than is usually the case. At the end of twenty-four hours the patient is distinctly lethargic, verging on complete somnolence. At the end of thirty-six hours coma has intervened and within forty-eight hours the patient dies without ever having actually emerged from a semicomatose condition. During the first twelve hours the urine has been of ample amount and from then on begins to fail progressively. The temperature rises from the moment of the termination of the operation and at the time of death is 104°-105°, or possibly 106°. The pulse rate parallels the temperature rise; and, if the pulse were 90 at the termination of the operation, it slowly goes up to 130 or 140. Clinical examination of the lungs shows no pneumonia. Chemical examination of the blood shows a normal ieteric index and an ascending scale of urea nitrogen. The death certificate is signed "uremia." In our opinion this case is not uremia nor can it remotely be connected therewith. Some five years ago when we began to study our postoperative mortalities, we at first considered

these deaths as possibly due to an acidosis. Upon taking carbon dioxide combining power determinations we were surprised to find that an acidosis was not present; but, on the contrary, there was a distinct change in the alkali balance of the blood and we were dealing with a chemical condition that was essentially an alkalosis. We believe that this is not an infrequent postoperative complication in surgical conditions in the abdomen. Alkalosis may vary in degree from slight to severe to lethal. In the presence of persistent vomiting after laparotomy recourse should be had to blood chemistry determinations. If this indicates an increase in urea nitrogen, a decrease in chloride, and plus carbon dioxide combining power, alkalosis is the probable diagnosis and remedial measures should be adopted before the urine begins to show marked evidence of renal damage.

In alkalosis the administration of glucose is always advisable for two reasons: (a) because glucose helps to maintain the nutrition of the body—of all food material glucose is the most readily oxidized in the organism; (b) glucose is excellent for relieving dehydration. It is well to recall here that the administration of glucose is always useful in acidosis where its effectiveness is due to its property as an antiketogenic agent. However, inasmuch as these cases of alkalosis also have a severe degree of ketogenesis, the administration of glucose is of further value in this condition by reason of its specific antiketogenic effect.

We believe that glucose should be given either by rectum or by hypodermoclysis, because when it is absorbed from the tissues into the blood stream, it is transformed into that type of glucose normally found in the blood—the glucose which can be most readily oxidized. An excess of glucose administration should be controlled adequately by hypodermic injections of sufficient quantities of insulin.

The administration of sodium bicarbonate before operation is always dangerous unless it is carefully controlled by the CO_2 combining power of the blood. Determining the reaction of the urine to litmus paper is of no value and as a matter of fact may be misleading in gauging the amount of sodium bicarbonate to be utilized, because it has been shown that the CO_2 combining power of the blood and P_H of the blood plasma may be increased much above the normal before the urine becomes alkaline in reaction. The administration of sodium bicarbonate should be based upon the level of the CO_2 combining power of the plasma, utilizing Palmer and van Slyke's formula; that is, 0.5 gram of sodium bicarbonate will elevate the CO_2 combining power of the blood plasma one volume per cent for each forty-two pounds of body weight. Giving sodium bicarbonate beyond this limit elevates the bicarbonate of the blood plasma above the upper normal level and produces the uncompensated alkalosis which may lead to death in tetany.

The treatment to prevent what I have called "Chemical Deaths" following surgical intervention for abdominal disease is based upon the following considerations: 1. A continuous and persistent effort to combat the dehydration, whether it is sequential to vomiting or not. This is best accomplished by using known quantities of fluid, through all channels—water with 10 per cent glucose by rectum in the form of Murphy drip, normal saline with 5 per cent glucose by hypodermoclysis and normal saline with 5 or 10 per cent glucose solution intravenously. If the carbon dioxide combining power tends to the left, indicating a condition of acidosis, the glucose is particularly beneficial, because in the oxidation of glucose there is a destruction of the ketogenic bodies. If the carbon dioxide combining power moves to the right, indicating an alkalosis, the administration of glucose is primarily to prevent dehydration and in an important, but secondary rôle, the prevention of protein destruction. Associated with this is the giving of acid phosphate solution, 4 c.c. every two to three hours, as this has a distinct effect in lessening the alkali balance. If vomiting is persistent, this may be given by rectum.

2. Gastric rest is obtained by the introduction of a Levine tube, preferably passed through the nose and maintained in situ by affixing the tube to the patient's cheek with adhesive tape. This is particularly important if there is duodenal reflux, as it means a complete decompression of the stomach and maintains the stomach in a condition of rest and tranquillity by continuous evacuation of its contents. The Levine tube is passed over the side of the bed, placed in a bottle, and on the principle of siphonage keeps the stomach continuously empty.

A very simple test determines the evacuating capacity of the stomach. At a certain hour eight ounces of water are given by mouth, the patient drinking it freely; the Levine tube is clamped off and after an hour the contents of the stomach aspirated. If more fluid is obtained by aspiration than is given, it is obvious that the stomach is not emptying but is adding to its contents by regurgitation. If the quantity obtained by aspiration is less than that given, then the stomach is evacuating some portion of the fluid given. During the time the Levine tube is in place the patient may drink water and so allay the sensory and subjective sensations of thirst without endangering gastric tranquillity, as the fluid ingested is immediately drained back into the bottle by means of the Levine tube. The Levine tube is kept in the stomach until definite improvement occurs when the tube may be utilized for the purpose of fluid replacement by connecting a Murphy drip apparatus to the Levine tube, giving as high as 5 per cent glucose solution by the drip method.

3. In cases in which there is evidence of intestinal obstruction or marked jejunal reflux, jejunostomy has been a satisfactory procedure

in our hands. It completely takes care of the retrograde peristalsis and prevents the overwhelming toxemia of high intestinal obstruction and later is a ready means of fluid replacement by attaching the jejunostomy tube to a Murphy drip.

4. It is essential to have repeated blood chemistry determinations to control or indicate further therapy.

5. If symptoms of tetany appear, 5 c.c. of a 10 per cent solution of chloride of calcium are given intravenously and repeated when necessary.

6. Finally, avoid solutions of soda bicarbonate in any form; as soda bicarbonate is frequently employed for gastric lavage, it is particularly important to bear this point in mind.

115 EAST FIFTY-THIRD STREET.

TRANSITION TO MALIGNANCY IN BENIGN LESIONS OF THE UTERINE MUCOSA

BY WILLARD R. COOKE, M.D., GALVESTON, TEXAS

THERE is probably no field in medicine that is generally more neglected or more poorly managed than the recognition and treatment of cervical and uterine lesions, benign and malignant. This is especially true in regard to the lesions which may be regarded as the forerunners of cancer of the cervix and endometrium. The importance of these "precancerous" lesions as a factor in the reduction of morbidity and mortality from malignant neoplasm can scarcely be overestimated. General recognition of the following facts would lead to adequate treatment of such lesions while still in the definitely curable stage:

1. Transition to malignancy occurs with varying frequency in a number of benign lesions.

2. Gross differentiation of these lesions from actual early malignant neoplasm cannot often be made.

3. Histologic study of biopsy specimens will, even in our present state of knowledge, afford a sounder basis for the treatment of such lesions: both through affording recognition of malignant and premalignant conditions and through the ruling out of malignancy in benign lesions suspiciously malignant in gross appearance.

4. On the other hand, there is a possible factor of error in diagnosis through biopsy alone which, though small, is sufficient to warrant the treatment of a lesion as malignant on adequate clinical evidence in the face of a negative biopsy report.

5. The removal of biopsy material is easy, involves no risk, there are no ill results, and the cost to the patient is justifiable.

Cervicitis and laceration of the cervix per se are adequately covered in the textbooks and in the current literature; but recognition of the

potential for malignancy in these, and especially in other lesions, is given little emphasis. In other fields of practice potential malignancy is fully recognized and given due stress: for instance in vesical papilloma and in chronic gastric ulcer. Yet in these fields such recognition is of less importance than in the lesions of the cervix and endometrium on account of the relative infrequency of the former, the relatively advanced stage which is often reached before suspicious symptoms appear, the relative difficulty in obtaining biopsy material, and the relatively incurable status of the lesion when treatment is instituted. Moreover, in the practice of gynecology, laboratory methods as an aid to diagnosis are far too often disregarded or neglected. In this respect gynecology has lagged far behind internal medicine and other branches of practice. The objection is often made that biopsy-diagnosis involves an unjustifiable amount of discomfort and expense to the patient, in view of the relative infrequency of significant findings. Surely, the removal of a bit of tissue from the cervix or of scrapings from the endometrium does not entail either as much discomfort or as much expense as the serologic and chemical study of the blood and spinal fluid; yet these procedures are almost routine with the internists, even where there are no clinical features suggestive of their necessity, and significant findings are of far less importance than the discovery of an early cancer or sarcoma. What is even worse, curettage under anesthesia (often without reason) is an everyday procedure, and in such operations the material obtained is thrown away and gross lesions of the cervix dismissed with a useless scraping or a touch of some chemical agent. Another common and very serious error is seen in the performance of some plastic operation on a cervix which is the seat of a lesion whose innocence cannot be established except through histologic study. There are two examples of this error in material received in our laboratory.

In the material obtained in the Gynecologic Service of the John Sealy Hospital (the teaching hospital of the University of Texas) actual transition to malignancy has been observed in the following lesions:

1. Laceration of the cervix with cervicitis, with and without eversion.
2. The lesion known variously as eversion, erosion, ectropion, which is listed by us as ectropion.
3. Chronic cervicitis.
4. Adenoma of the cervix.
5. Adenoma of the endometrium.

LACERATION OF THE CERVIX

We have seen no cancer originating in a cleanly healed laceration. Where laceration is present, the condition of the overlying and surrounding mucosa has seemed to be of more importance than the presence of scar tissue. While we are not at all ready to dismiss the cleanly healed laceration as an etiologic factor in cancer, we feel that complicat-

ing eversion, ectropion and cervicitis are much more important. In the few cases of cancer occurring in lacerated cervixes where an adequate description of the conditions found at previous examinations was available, some lesion other than laceration was always noted.

EVERSION, EROSION, ECTROPION

There is so little unanimity in the nomenclature of this group of grossly somewhat similar lesions that it is difficult, in reading, to determine just what is meant by a given writer. On an etymologic basis we have adopted the following definitions:

Eversion.—A mechanical “turning-out” of the glandular epithelium of the cervical canal, through the gaping of the lips of a lacerated cervix plus the covering of the raw surfaces of the laceration by outgrowing cylindric epithelium; or, somewhat doubtfully in chronic cases, through the pouting of swollen tissues about the external os.

Erosion.—An excoriation of the surface epithelium to varying depths.

Ectropion.—A “growing-out” of cylindric epithelium, replacing the normal squamous epithelium of the area involved.

Whether this or another nomenclature be considered best, we believe that the general adoption of a standard set of definitions would be of real value.

EVERSION

The exposure of cylindric epithelium to an abnormal environment may result in (1) inflammation (practically always); and (2) a metaplasia to the squamous type of epithelium (which is apparently a protective process). It seems probable that either of these processes may be conducive to the development of malignancy. There will be no attempt in this paper to discuss the exact process by which this transition is initiated, since in our material we have seen nothing to indicate whether the change is due to metaplasia, to the occurrence of cells of specifically malignant potentiality, to “irritation,” or to any other definite factor or process.

In studying the gross appearance of the visible epithelium of the genital tract we have found that tincture of iodine is a valuable gross differential stain. On application the whole area is stained a uniform medium brown; very promptly this color disappears from any raw surfaces, leaving them pink; in a few more moments the squamous-cell epithelium develops a very deep and lasting brown color (in the skin the shade is lighter); while the glandular epithelium is stained a pinkish brown which fades rather rapidly to the normal color. (This differential stain has also proved of great value in plastic work about the cervix and perineum, especially in the immediate repair of obstetric lacerations.) With the aid of this stain I have followed a number of minor lacerations of the cervix through the process of healing after labor.

At first only the raw surface of the laceration is evident. After about forty-eight hours on the average a definite encroachment of rather poorly-staining epithelium is seen creeping in from the outer edges of the raw surfaces; the rate of this ingrowth varies greatly, the raw surfaces having been completely covered in two cases within five days, while in the average case, healing is practically complete in ten days. In almost all cases there is also a relatively slow outgrowth of cylindric epithelium, forming a zone of varying width along the inner edges of the raw surfaces. In a few cases the cylindric-cell outgrowth has overshadowed the squamous-cell ingrowth, the greater portion of the raw surface being covered by a slowly-formed sheet of cylindric-cell epithelium. In these cases, and in the cases which healed slowly by the normal process, granulation tissue became apparent. We consider the process of covering with squamous-cell epithelium as the normal protective process, and the result as the cleanly-healed laceration. As indicated above, we have no evidence in our material that this condition is conducive to the development of cancer; yet we do not consider that the innocence of this condition can be even presumed, as yet. To the process of covering of the raw surfaces with cylindric-cell epithelium, we have given the name of "eversion"; sooner or later we have found that such a cervix becomes the seat of chronic inflammation; and we have seen several instances of the appearance of early cancer in cases of eversion.

From the practical point of view, we feel that this study lends weight to the theorem that lacerations of the cervix should receive adequate care promptly after labor: in extensive tears, immediate or delayed repair (dependent upon the environment) should be done; in minor lacerations, the cervix should be treated by cauterization of any surfaces which are granulating or covered with cylindric-cell epithelium, this to be done on the tenth day or at the end of the fourth week. All cases should be reexamined at intervals, and all persistent areas of granulation tissue or cylindric-cell epithelium recauterized until all of the exposed surfaces are solidly covered with squamous-cell epithelium. In this work, the iodine stain has proved invaluable.

EROSION

As defined above, we have seen this condition in only two nonpuerperal cases, as compared with several hundred cases of ectropion and eversion. It is, however, quite common as an apparently transient process following labor. We have seen a narrow zone of denuded cervical tissue at the edge of several specimens of ectropion; but in these instances the possibility of artefact was so great that we had no assurance that such apparent erosions were a part of the process of ectropion. The great majority of the ectropia showed no evidence of a zone of erosion, either microscopically or by the gross iodine stain

We have had two cases, diagnosed clinically as erosion, which proved to be very early inverting epitheliomas.

Our rule of clinical procedure is that all nonpuerperal erosions be subjected to biopsy. In the case of the tiny multiple excoriations so commonly seen in connection with an irritating cervical discharge or consequent upon the injudicious use of chemical douches, biopsy is not done as a primary procedure, as it has been found that such lesions heal promptly on the elimination of the etiologic factor; if they persist, however, after a reasonable period of treatment, biopsy is indicated.

ECTROPION

This is an exceedingly common process, in itself deserving early recognition and thorough treatment because of the symptoms to which it gives rise. (Parenthetically, sterility is notable among these symptoms: with the possible exception of retroversion, there has been no single condition in my experience in which sterility has been so definitely and promptly relieved by adequate treatment.)

From the standpoint of etiology we recognize two varieties of ectropion:

1. Developmental ectropion, apparently due to abnormal differentiation of the epithelium of the portio vaginalis of the cervix about the external os; possibly as a congenital process, and possibly occurring in connection with the rapid changes incident to adolescence. This variety is very common in adolescent virgins, and gives rise to much unnecessary discomfort, dysmenorrhœa, and disability through neurosis. Usually, by the time a microscopic specimen can be obtained, complicating inflammatory processes have set in.

We have no evidence that this condition is of any consequence as a precancerous lesion in the virginal adolescent patient; hence we consider that biopsy is not indicated unless the lesion fails to heal after proper treatment.

2. Acquired ectropion, in which the stimulus to abnormal growth is unknown. From our material we are inclined to believe that antecedent erosion is not essential; that the process is one of replacement and not of metaplasia; and that while chronic cervicitis is present in most cases, we are not sure that it is not merely a coincidental condition, since identical ectropia have been seen without evidence of inflammation.

Structurally, there are three types of ectropion: the simple type, in which the glandular mucosa is grossly smooth and histologically resembles the ordinary mucosa of the cervical canal, with or without various inflammatory changes; the follicular (granular or glandular) type, in which the surface is granular, with histologic evidence of hyperactivity in the pseudoglands; and the papillary type, this name being self-explanatory. The last type is the one we have seen most often in specimens from adolescent virgins, and may represent an

attempt at the formation of rugae like those of the arbor vitae of the cervical canal. We have seen nothing to indicate that there is any difference between these types as regards their clinical or pathologic course.

We recognize three stages in the normal life-history of ectropion: the progressive stage, during which the glandular epithelium spreads out gradually from the external os, replacing the normal squamous-cell epithelium; the quiescent stage, in which the process of growth remains inactive, usually over a period of years; and the regressive or healing stage, in which the growth-process is reversed, the squamous-cell epithelium growing inward to replace the ectopic glandular epithelium. The most interesting feature of the whole process is the plugging of the pseudoglands through down growth of squamous epithelium into their lumina in the process of healing: the lining of the gland-cavity, now packed with squamous cells, gradually perishes, leaving peninsulæ or even islands of squamous cells deep in the stroma of the cervix. Normally, these plugs flatten outward to the general surface-level, and ultimately disappear.*

THE PRECANCEROUS CERVIX

Some years ago, Henry Hartman described an interruption of the normal healing process in ectropion, which he designated as the "precancerous cervix." Briefly, this condition presents the microscopic picture of active proliferation in the ingrowing squamous cells of ectropion, usually in the peninsulæ described above, accompanied or followed by round-cell infiltration of the subjacent tissues. Similar changes also occur in eversion and in chronic cervicitis; in these, the cellular proliferation may occur in either the squamous or the cylindrical epithelium. We are inclined to believe that this is a real pathologic entity, since we have observed several indubitable early cancers in which the picture very strongly suggested that the cancer had its origin among the rapidly growing and apparently nonmalignant cells typical of the "precancerous cervix." Unfortunately, from the academic viewpoint, all of our own cases of this type were adequately treated at the time the biopsy material was obtained so that we have no positive evidence from this standpoint that a continuance of the process would result in cancer. We have, however, several specimens of cancer in which a previous clinical diagnosis of precancerous cervix had been made, biopsy and treatment being refused by the patients; and six cases where a laboratory diagnosis of precancerous cervix had been made before the patients came into our hands with definite early cancer.

Two cases clinically diagnosed as precancerous were found to be actually malignant.

*For an excellent concise description of the whole process, see R. T. Frank, *Gynecological and Obstetrical Pathology*, in the *Gynecological and Obstetrical Monographs*, Appleton & Co., New York.

The clinical diagnosis of precancerous cervix is made on the history of the symptoms of chronic cervicitis, with or without blood-stained discharge, plus the finding on examination of a grossly proliferating eversion, ectropion, or chronic cervicitis which bleeds freely upon being lightly rubbed with a cotton-tipped probe.

Treatment of eversion, erosion, ectropion, and precancerous cervix: We believe that our findings fully justify biopsy as the essential corner stone in the safe treatment of these lesions, except in transitory erosions and in vaginal adolescent ectropion. Unless the biopsy specimen be sufficiently large, chosen to include the most grossly suspicious-looking areas, and promptly placed in the fixing fluid, the pathologist's report is apt to be misleading. An important and common fault is the acceptance of a visible surface lesion as the essential feature of the case, neglecting investigation of the cervical canal and uterine cavity. As mentioned before, if from the clinical evidence there is doubt of the reliability of the pathologist's report of "no evidence of malignancy," the case should be treated as for malignant disease.

At the time of removal of the biopsy specimen in cases of simple cervicitis, erosion, and ectropion, all exposed cylindrical-cell epithelium is destroyed by cauterization, down to the fibromuscular substance of the cervix, including also a narrow strip of the circumjacent squamous-cell epithelium. Anesthesia is unnecessary except in very extensive lesions, so that this treatment is almost always an office procedure. The subsequent management consists in the prescription of douches of 4 per cent saline solution twice daily, with inspections at weekly intervals until healing is complete. In cases of extensive eversion where denuded areas may become apposed through the shrinking of the cervix, measures to prevent partial or complete occlusion should be taken at each inspection. At the end of four weeks the treated area is restained with tincture of iodine: this brings out sharply any islands of ectopic cylindrical-cell epithelium and any areas of granulation tissue, which are then retreated with a small cautery. Such cases require the same treatment and observation as for the primary procedure. This treatment has been employed for ectropion and eversion in 211 hospital cases and in 226 office cases, with so far extremely satisfactory results. Our follow-up records show definitely a greater freedom from complications and a better final condition than were secured after any form of tracheloplasty.

From our material, the same treatment is adequate also for precancerous cervix; but in these cases the cauterization should be much more thorough, going more deeply into the tissues, and including a zone of 3 to 5 mm. of healthy tissues around the periphery of the lesion; and these cases should be kept under monthly observation for at least a year after apparently complete healing, and warned to report promptly on the appearance of any suspicious symptom, especially of a watery, irritating, brown, or blood-stained discharge.

Treatment of precancerous changes within the cervical canal: In these cases the cautery cannot be freely used on account of the danger of serious cicatricial stenosis, and the problem is difficult. Our material is far too scant to justify the recommendation of our plan of procedure in cases of precancerous change within the canal diagnosed by biopsy, which is as follows: 1, patient under thirty-five years of age potentially fertile: Sturmdorf tracheloplasty; 2, patients incurably sterile or thirty-five to forty years old; high transverse amputation of cervix; patient over forty; radium, unless contraindicated. Exceptions to these rules based on common sense as applied to the individual case, are frequently made.

CHRONIC CERVICITIS

There is no need for discussion of this condition, as its malignant potentiality is recognized, and because our material has afforded us no new or interesting findings.

ADENOMA OF THE CERVICAL MUCOSA AND ENDOMETRIUM

Opinion in regard to the real character of the adenomatoid lesions of these structures is so diverse that we have undertaken a study based upon the grouping of the specimens according to:

1. The menstrual phase at the time of removal of the specimen.
2. The existence and degree of complicating circulatory, inflammatory, and neoplastic conditions.
3. The histologic evidence of intrinsic inflammation.
4. The gross and histologic structure.

Pending the accumulation of an adequate amount of material no report on this study will be made. We do believe, however, that a considerable number of the polypoid growths, both in the cervix and in the corpus uteri, are true adenomas. No conclusion has as yet been reached in regard to the diffuse polypoid overgrowth which has been variously designated as polypoid endometritis, fungoid endometritis, polypoid hyperplasia, etc. Simple diffuse hyperplasia of the endometrium is of course recognized as a definite histologic entity, although there is much yet to be learned in regard to its etiology, its relation to the polypoid type of hyperplasia, and its ultimate significance.

From the clinical viewpoint, abandonment of the term "polyp" seems a valuable step forward. Several utterly diverse lesions are so diagnosed without reference to their pathology, which is the only logical basis for treatment. Recent or organized blood clot; masses of organized exudate; placental moles; adenomatoid growths; the various polypoid endometrial trophic (?) lesions; pedunculated submucous fibromyomas; everted cancer; chorionoma; and sarcoma are all referred to in the literature by various writers as "polypi."

Four specimens from our material deserve mention, as they represent definite malignant change in the so-called "mucous polypi." The older textbooks denied the possibility of such a development; in the more recent editions the possibility of malignant change is recognized, but the emphasis is so scant that the statements are apt to pass unnoticed unless specifically sought. It is true that malignant change is very rare in these lesions; yet the prevention of one death from cancer fully justifies the microscopic examination of a thousand innocent adenomas.

One of our specimens is from the cervix; three from the endometrium. It is especially significant that the first report on the biopsy specimens from three of these endometrial growths read: "no evidence of malignancy"; a finding which was easily explained by the fact that sections made from the periphery of these growths after removal were typical of nonmalignant adenoma, the carcinoma occurring only in and about the pedicles.

Sarcoma has not occurred in our material.

In treating clinically benign growths of this type, biopsy should always be done; and, as a safeguard, the area surrounding the bases of accessible adenomas should be thoroughly and deeply cauterized in every case. It is our rule, in dealing with relatively inaccessible lesions, to treat them as malignant if the clinical findings are sufficiently suggestive, regardless of the pathologist's report. This rule has been justified at least six times by the finding of malignant disease in the removed uterus, when nothing of the sort could be found in the biopsy specimen.

CONCLUSIONS

1. Transition to malignancy is sufficiently frequent in and about ectopic glandular epithelium and in accessible adenomatoid growths as to demand routine biopsy and radical destructive treatment with the cautery (especially since this is the most effective treatment of such lesions if benign). Exception: the necessity for biopsy is not imperative in cases of eversion or ectropion in patients under twenty-five years of age unless the lesion bleeds freely on slight trauma or unless it fails to heal promptly after adequate cauterization and after-treatment. In cases where there is the slightest doubt as to the gross diagnosis, biopsy should be done as a preliminary to the treatment of any coexistent lesions, especially before undertaking any plastic work about the cervix.

2. All adenomatoid lesions of the cervix and endometrium demand careful histologic study; if the clinical picture is sufficiently suggestive, the condition should be treated as if definitely malignant.

3. All easily-bleeding lesions and all single large or deep erosions should be subjected to biopsy, being careful to secure a piece of tissue which includes the entire lesion and its edges.

4. Promptness and thoroughness in investigating and treating all cases of cervical and endometrial disease (especially if metrorrhagia, however slight, be a feature) will result in a definite decrease in the incidence of cancer in these loci.

This study is based upon the following material from the records of the Gynecologic Service of the John Sealy Hospital and the Laboratory of Gynecic Pathology of the University of Texas (tabulated below); upon a considerable number of office cases; and upon 444 specimens in the Laboratory of General Pathology of the University of Texas (not tabulated on account of some duplication).

Eversion, Erosion, Ectropion	211
Precancerous Cervix:	
Clinical Diagnosis: Precancerous, microscopic negative	54
" " Cancer, first stage, microscopic precancerous	8
" " Confirmed by microscopic examination	43
" " Adenoma, microscopic precancerous	1
Cancer of Cervix, all types:	
Clinical Diagnosis: Unsuspected	2
" " Adenoma	1
" " Doubtful	3
" " Correct, first biopsy report precancerous	3
" First stage	8
" Second stage (Cervix only involved)	20
" Third stage (Parametrium involved)	123
Carcinoma Endometrium	
Clinical Diagnosis: Correct	9
" " First biopsy report negative	3
" " Incorrect	3

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THE SURGICAL TREATMENT OF CERTAIN PUERPERAL INFECTIONS

BY J. F. BALDWIN, M.D., COLUMBUS, OHIO

*"The woman about to become a mother, or with her new-born infant upon her bosom, should be the object of trembling care and sympathy wherever she bears her tender burden, or stretches her aching limbs. * * * The solemn prayer of the liturgy singles out her sorrows from the multiplied trials of life, to plead for her in the hour of peril. God forbid that any member of the profession to which she trusts her life, doubly precious at that eventful period, should hazard it negligently, unadvisedly, or selfishly!"—Oliver Wendell Holmes, "Contagiousness of Puerperal Fever," 1843.*

JUST twenty years ago I had an experience which led me to make a most thorough study of puerperal sepsis, as the patient and the families on both sides were all personal friends. The patient was wealthy, so that there was no stone left unturned to secure her recovery. This was in the days before blood counts and blood cultures. She was twenty-eight years of age, the mother of two children, the youngest just three weeks old. She had a chill a day or two after the birth of this child. The birth was normal in every way, but the attending physician was a surgeon who was notoriously a disbeliever in microbes. He had

made but one vaginal examination, and that several hours before the birth of the child, which took place a very few minutes after he reached the house the second time. She had been having daily chills, with a daily range of 10° of temperature. Lochial discharges normal. Her physician had attributed her febrile condition to "nervousness." I saw her in consultation immediately after there had been a change of physicians. At that time there was a large mass in the pelvis on the left side of the uterus. She was brought to the hospital at once and placed in a large, quiet, sunny room, with three special nurses in charge, and with two of our best physicians in frequent attendance. The next day, under an anesthetic, examination seemed to indicate the presence of a small abscess in the left broad ligament. This was opened through the vagina and gave exit to about a dram of thick odorless pus; but the opening of the abscess had no effect on the progress of the disease. A few days later she was seen in consultation with Dr. Gustav Zinke, of Cincinnati, who found no indication for any surgical procedure; but who, although he said he had no faith in such treatment, advised anti-streptococcus serum, which was given her freely. He saw her in consultation again ten days later but could offer no further suggestions. She became delirious and died, with all the typical symptoms of puerperal sepsis, eight weeks and one day after the birth of her child. Autopsy was earnestly urged but refused.

With my present knowledge I am quite certain that a sufficiently radical operation made when she entered the hospital would have given her at least a 75 per cent chance for recovery; her condition at that time being strikingly similar to that of Case 2 of my series.

At the Buffalo meeting of this Association, in 1914, I read a brief paper on the operative treatment of puerperal thrombophlebitis. Four cases were referred to but only the fatal one was reported; a mortality of 25 per cent. At the meeting of the Association in Albany, in 1922, a much more elaborate paper was presented with detailed reports of 67 cases, with a mortality of a little less than 30 per cent. During the intervening years, up to 1929, seventeen cases were operated upon with a mortality of 17.6 per cent. So far during 1929 I have operated upon six patients with no deaths. One of these, and clearly the most hopeless of the number, I had the pleasure of presenting to this Association at our clinical meeting at Columbus last March, just a few days before she went home with her baby. We have, therefore, a total of 90 cases with 23 deaths; a death rate of 25.5 per cent; and the contention is that these 90 cases belong to a class which without operation give a death rate of 100 per cent; so that 67 mothers were saved.

If a hospital places all its puerperal infection cases in one class, and counts as infected those which on two successive days present a temperature of 100.5° , the death rate will be very small; but if the cases are classified as suggested in my Albany paper, the death rate in Class 5

will be 100 per cent; but this class will constitute but a small part of the total number of infected cases. In my Albany paper there appeared a fairly full history of the 67 cases, but necessarily these histories had to be condensed. I have repeatedly challenged the obstetricians to pick out a single one of those cases that in their opinion would have recovered without operation. Thus far no one has accepted the challenge. If any one should attempt it and pick out such cases, I would be only too glad to give him such complete notes and details as might cause him to change his opinion.

Dr. C. Jeff Miller, in his article on this subject in Dean Lewis' *Practice of Surgery*, Vol. 10, states that puerperal infection is "essentially a wound infection which is identical * * * with wound infections elsewhere in the body." Wound infections in general are universally looked upon as surgical and to be treated on surgical principles, though by no means necessarily by operation. It is a leading principle in surgery that where there is pus it must be evacuated, the only real questions being in each case when and how to secure evacuation. The late Samuel D. Gross, in his monumental work on Surgery, relates a case in which death resulted from a single abscess the size of an almond, no other pathology being found at autopsy.

Those of us who are old enough can remember, and the younger ones can readily get an idea of it by reading, the ridicule heaped upon Lawson Tait by his colleagues over his diagnosis of pus tubes, when the London surgeons would tell inquirers that pus tubes "were only found in Birmingham." We can remember also the denial by Tait himself of the possibility of making a diagnosis of tubal pregnancy before rupture; and the delay and opposition met with by the surgeons of a few years ago in regard to the diagnosis and operative treatment of appendicitis. Just recently I happened to pick up the volume of transactions of the Ohio State Medical Association of 1899, in which appears a symposium on appendicitis participated in, among others, by Ricketts, Reed, Johnstone and Reamy, of Cincinnati, Sherman and Crile, of Cleveland, and Kinsman, Hamilton and myself, of Columbus, the gist of which was that not less than 80 per cent of patients with appendicitis recover without operation, and that operation should be made only after very careful consideration.

It is becoming more and more evident that operative procedures in this class of cases of puerperal infection will ultimately be adopted. At the Cincinnati meeting of the Ohio State Medical Association last year Dr. Palmer Findley, at that time president of this Association, delivered an address on the subject of puerperal infection. His treatment was distinctly nonoperative, but at his conclusion he referred to my work as follows: "I am aware of the splendid work which Dr. J. F. Baldwin of your state has done in pyemic cases and of the favorable

results he has obtained, but such results can only be obtained in the hands of a master diagnostician and operator."

I was not present at that meeting and did not know of his complimentary remarks until his paper was published; then, to use the language of the witty Oliver Wendell Holmes when somewhat similar phrases were used about his paper on the contagiousness of puerperal fever, his compliments "made me blush either with modesty or vanity, I forget which."

I promptly wrote to him protesting against being placed in a class by myself and insisting that there were plenty of other surgeons who could do similar work. I reported to him at the same time two recent cases upon which I had successfully operated; but my protest signally failed to convince him for in his reply he said: "I recognize that there are a few men but a very few, who have the ability and experience to get away with such surgical intervention; but the rest of us will certainly meet with disaster. I am perfectly frank in saying to you that I feel that your results are remarkable and this can only bespeak such surgical judgment and technique as few men possess. This is a real compliment to you, my dear fellow, and in no way an endorsement of the procedure as it would be practiced in general."

A number of surgeons, several of them Fellows of our organization, have been equally complimentary in commenting on my results, but claim their inability to follow my lead. Doubtless my large and long experience, coupled perhaps with some native mechanical ability, does enable me to operate more rapidly and with less trauma than many others, and my very careful bimanual examinations have perhaps developed a certain *tactus eruditus* possessed by only a few, but I insist that there are many surgeons who possess such an ample degree of diagnostic ability and operative skill as to operate successfully on these cases *if they will only give each patient the proper amount of careful personal study*. The study of these cases should not be left to interns and assistants. The surgeon should feel in each case the responsibility indicated by Oliver Wendell Holmes, and govern himself accordingly.

These cases are admittedly not cases for the surgical tyro, but each patient is entitled to the best that surgical and diagnostic skill can offer. No man should operate who requires more than thirty minutes for anything like an ordinary hysterectomy, nor should anyone operate who is not thoroughly familiar with his anatomy and pathology. That occasionally an unnecessary operation may be made is beyond question, but the possibility of such an occasional error should not deter from efforts to save these mothers.

I will report the case of only one patient, the one shown at our clinical meeting last March. The other cases operated upon since my report of the 67 cases in 1922 are so similar to those cases that I can only refer those who are interested to the report of those cases as it appeared

in our volume of *Transactions* of that year. I report this one case because it was probably the least hopeful of any, though several others would certainly be a close second as was one of those which I reported during the discussion of Dr. Polak's paper last year at Toronto.

Jan. 31, 1929: Mrs. H. T., aged twenty-four. Married two years; one child, aged eighteen days. Patient passed through an entirely normal and happy pregnancy. The child was born in a few minutes after entering the hospital, and the afterbirth followed a few minutes later. No examinations of any kind had been made. The next day, however, she had a chill followed by the usual symptoms of profound sepsis, though with no additional chills. Her physician applied mercurochrome to the walls of the vagina and packed some gauze dipped in mercurochrome into the uterus, but this was without any effect. A little later some tissue was removed which was looked upon as possibly placental, but the microscopist reported that it was a piece of endometrium. When I saw the patient in consultation on the eighteenth day, the hospital notes showed a rapidly progressing anemia, with a high leucocytosis and a daily elevation of temperature to 104.5° ; she was profoundly septic. The pelvis was filled with a solid mass of exudate, and pressure along the inside of the right ilium showed a point of extreme tenderness which I assumed was an abscess of the right ovary. Prompt intervention was advised, and carried out the next morning.

Examination under the anesthetic showed nothing new. On opening the abdomen, the uterus was found much larger than it should have been, and the fundus free from adhesions. Below the fundus, however, the uterus was simply bedded in masses of exudate on all sides; both broad ligaments extensively involved. Both tubes edematous. The omentum adherent to the right ovary, which was found abscessed. Separation of adhesions showed multiple abscesses throughout the pelvis. A panhysterectomy was made, but the left ovary and tube were saved because of the youth of the patient. The tissues were exceedingly friable so that it was impossible to implant the round ligaments into the vault of the vagina. The usual gauze fluff was inserted and the sigmoid attached completely around the brim of the pelvis.

Hasty examination of the specimen showed an abscess of the right ovary and an abscess in the posterior wall of the uterus. All the tissue was referred to the laboratory which soon reported "small pockets of pus within the uterine wall." "Multiple abscesses in ovary containing greenish-yellow exudate." The laboratory finally reported: "(1) Acute suppurative metritis. (2) Acute suppurative endometritis. (3) Acute suppurative salpingitis. (4) Acute suppurative oophoritis." Culture of the pus showed "many short-chain streptococci, *Staphylococcus aureus* and *albus*."

Patient had a rather stormy convalescence but went home happy with her baby March 17.

On the continent, two eminent surgeons, Gosset and Autefage, have come out strongly in advocacy of treating these cases on general surgical principles and by radical operative procedures. I am indebted to Dr. Albert De Groat, of Fayetteville, Ark., for a report of two cases of puerperal infection operated upon by Autefage, in both of which hysterectomy was followed by recovery. Autefage contends that hysterectomy is indicated in puerperal infection when, after an abortion, the temperature remains high and chills persist in spite of complete evacuation of the uterus, and when a subacute infection occurs after labor with marked systemic symptoms and appreciable lesions of the uterus and adnexa.

In a letter just received recently from one of our Fellows, heretofore very pronounced in his opposition to any radical operation, he tells me he has become half a convert at least, and has recently operated upon two of these patients with recovery.

As an evidence of the on-coming of operative procedures in these cases, it may be mentioned that at the meeting of the Section of Obstetrics and Gynecology of the Massachusetts Medical Society last June, a paper was read by Dr. Kiekham, Senior Visiting Obstetrician to St. Elizabeth's Hospital, on the treatment of puerperal sepsis. In the course of his paper the doctor says that he "feels that in a certain number of cases, surgery with removal of the uterus will save a percentage of patients. He bases this opinion on cases which have come under his direction where they did not have a fulminating infection that kills in a few days and in which no treatment seems to be of value, but where they went along for ten days or more with gradual weakening and ultimate death, despite general stimulative measures. His deductions were, that in this type of cases, the removal of the large focus of infection would prevent further injection into the general circulation of toxin or bacteria and allow the forces of nature, that were already battling the disease, to overcome the amount of toxin or bacteria that was already in the system." (*New England Journal of Medicine*, Sept. 5, 1929.)

In the volume of *Transactions* of this Association of last year appears a synopsis of 23 fatal cases of puerperal infection occurring in one large hospital. A study of these cases shows, so far as their records appear, that much was done in the way of laboratory study of the cases, but little or nothing in the way of anything like a thorough physical examination in any of them. Taking the records of these cases as they stand, it may be said that Cases 1, 5, 6, 7, 10, 12, 14, 15, 17, and 23 should have been given the chance of an operative procedure. There are one or two of the others that might have been operated upon successfully if operated upon early enough, but perhaps some of these others would have been found hopeless under a thorough local examination. It is probable that

this report could be practically duplicated by any large hospital admitting maternity cases and in which, *because of the rule of nonintervention*, no careful study is made of puerperal cases but all are placed in a common class.

During the last few months three puerperal deaths have occurred in one Columbus hospital. From what I could learn, all three were cases that apparently should have been operated upon. I happened to be present at the single autopsy that was made, and that showed the whole trouble to be clearly limited to multiple abscesses in the uterine wall, so that a hysterectomy would almost certainly have been successful.

In most cases requiring operation for puerperal sepsis an abdominal hysterectomy is advisable, with or without saving of the appendages as the case may require. Objection has been offered to this operation that all the pathology is not removed and that such incomplete operation would be of little or no avail. That argument might have some weight were it not that the technic advised gives ample drainage of infected tissues not removed, and that the *vis medicatrix naturae* can be depended upon to do the rest.

I have seen no reason to change the classification of these cases of puerperal sepsis which I made in 1922. (1) This class constitutes the great majority of the cases; in these the infection is limited to the endometrium and practically all recover if let alone. (2) The infection has passed beyond the uterine cavity into the broad ligament, where an abscess forms which can usually be readily opened through the vagina with prompt recovery, or if neglected will discharge itself. (3) The infection goes to the pelvic peritonium with a collection of pus in the culdesac, which also can be readily opened through the vagina. (4) The infection involves the subperitoneal tissue forming what the old writers described as "dry peritonitis." These cases promptly result fatally. (5) This is the class of cases considered in my paper of 1922 and in this. In some of these cases the infection is so fulminant and with so little resistance on the part of the patient that a prompt fatality is absolutely inevitable. A considerable number of these cases were reported in Dr. Holmes' famous essay on *The Contagiousness of Puerperal Fever*. Death occurs in some of these cases in a very few hours, and operation would necessarily be absolutely futile. Most of the cases, however, are not so acute and it is in those that operation is advisable.

Dr. Miller suggests the justifiability of laparotomy "as a last resort," but only when the case has become "frankly hopeless." This is interesting logic: forbid operation until the case becomes practically hopeless, and then, because of the large mortality, condemn the entire operation! The mortality of operations for intestinal obstruction is notoriously high, but no one condemns them on that account but rather urges earlier recognition and more prompt operation.

Some foreign surgeons, in making these hysterectomies, use the

Mikuliez tamponade when drainage is needed; that method, which I have used in a few abdominal cases in male patients, is infinitely inferior to the vaginal fluff drainage through the vagina which I have used in hundreds of hysterectomies for all forms of septic conditions. The Mikuliez drain is promptly surrounded by adherent intestines which thus predispose to postoperative ileus, and the delayed closure of the operative incision necessarily predisposes to postoperative hernia. By swinging the sigmoid around over the gauze fluff and attaching it to the peritoneum at the brim of the pelvis or just below, bringing over the cecum if the sigmoid is insufficient, the uncontaminated abdominal cavity is entirely separated from the infected pelvis. This gauze is withdrawn at the end of one week, after which vaginal douches are given as needed.

As to the operative technic: These patients are invariably in bad condition, and for that reason he only should undertake operation who is thoroughly familiar with the anatomy of the parts, who has a good working knowledge of gross pathology, and who has learned to avoid all false motions; he should not only have trained assistants, but should himself have had such an experience as will enable him to complete anything like an ordinary panhysterectomy in thirty minutes.

In case hysterectomy is found necessary, the cervix should invariably be removed, partly because of its probable infection but chiefly to have the vagina wide open for drainage. The round ligaments should be attached if possible to the margin of the vagina on each side, the posterior wall of the vagina split downward, and then the ends of liberal strips of gauze pushed down into the vagina, the rest of the gauze being made into a light fluff, not a *pack*, over which the sigmoid should be mobilized. Occasionally the infection will be found to have extended into one or both loins; in that case a strip of gauze should be firmly attached to the fluff and extended up to drain infected points. All of the gauze is to be withdrawn through the vagina at the end of one week. In very rare cases the infection may have extended so that there is an area above which cannot be safely drained through the vagina; only in such cases should a drain be placed at the lower end of the midline incision.

In mobilizing the sigmoid, the operator should first bring the sigmoid down and spread it across so as at a glance to decide as to the amount of tissue with which he has to work. He should then commence on the left side, being careful to have no sharp angulation at that point, and by continuous suture unite the anterior peritoneum to the sigmoid, continuing the process around to the right side, where again he should exercise care that there is no sharp angulation of the sigmoid which might later produce obstruction. If an ovary has been saved it should be brought up above the sigmoid so that it will not be buried in adhesions beneath. The omentum should be brought down and very carefully ad-

justed so as to still further cover over and protect the line of the sigmoid suture.

Whatever tissue is removed, this usually being the uterus with or without its appendages, care should be taken to ligate merely the arteries, leaving the veins open for drainage of infected contents, the fluff being so introduced as to cover over these open ends.

The gauze strips used in making the fluff should preferably be of iodoform gauze, hastily rinsed in water so as to remove any excess of iodoform and squeezed with the hand so that the gauze is simply moist and therefore "greedy" to absorb.

A satisfactory diagnosis of conditions requiring operation can only be arrived at by thorough, and usually repeated, examinations of the patient. The symptoms of metritis, as Dr. Miller so freely states, so closely simulate those of endometritis that positive differentiation is seldom possible until autopsy, but the persistence of grave symptoms might readily justify such a diagnosis as would render operative intervention not only wise but actually demanded. The operator, if in charge of the case, should make repeated and very careful bimanual pelvic examinations. The tender spots should be located and carefully studied at each subsequent examination. Records of pulse, temperature, blood counts, etc., should be examined meticulously, and a study of the patient's facial expression and mental condition should not be overlooked, as the facies might well be the determining factor in deciding as to operation. The quality of the pulse should be carefully considered as well as its mere rapidity. Finally, if in doubt, a diagnosis for operative purposes should be arrived at, as for any other purpose, by exclusion.

In conclusion: Diagnosis should be made more promptly in these cases, and can be made if the obstetrician will give each case personal and most careful study.

From the results obtained in ninety cases it seems evident that the diagnosis having been made, operation as radical as may be necessary to remove infected tissue, with ample drainage for that which must necessarily be left behind, will give a very satisfactory percentage of recovery.

ANATOMY OF THE FEMALE PELVIS AND PERINEUM IN RELATION TO LABOR

BY CALVIN R. HANNAH, M.D., F.A.C.S., DALLAS, TEXAS

(From the Obstetrical Department of Baylor University, College of Medicine)

THE term pelvis, as we shall use it in this paper, will be applied to the true pelvis or the pelvis minor, which is that portion of the abdominal cavity lying below the pelvic brim or linea terminalis and above the pelvic diaphragm. For purposes of anatomic completeness it would be necessary to discuss in connection with this space a floor and anterior, posterior and lateral walls; but for the purposes of this paper we deem it necessary to discuss only the floor.

The pelvic floor or pelvic diaphragm is composed of both muscle and fibrous elements. The fibrous element is the so-called endopelvic fascia. The endopelvic fascia is a continuation of the general fascial lining of the abdominal cavity being continuous over the iliopectineal line with the fascia descending over the psoas major muscle. This fascia passes down the lateral wall of the pelvis, over the obturator internus muscle to a line extending from the back of the body pubis backward to the spine of the ischium, being attached to both of these points. Along this line, which is known as the arcus tendineus, the fascia divides into two layers, and from the angle thus formed the greater portion of the levator ani muscles take their origin. The inferior layer of this fascia again divides into two layers, one of which clothes or covers the inferior surfaces of the levator ani muscles, thus forming the medial wall of the ischio-rectal fossa. The superior or medial layer of this pelvic fascia covers the inner or medial or superior surface of the levator ani and coccygei muscles becoming continuous across the midline with a similar layer of the opposite side thus forming a hammock-like fascial structure supported on each side by the corresponding arcus tendineus. This layer of fascia is known as the visceral layer of the pelvic fascia because it is the layer that is so intimately associated with the pelvic viscera.

We might think of the lower portion of the pelvic viscera, namely, the bladder, the urethra, the vagina, and the rectum as piercing this hammock-like structure. Thus, we see this layer of visceral fascia serving as a very important support for these organs.

It might be advisable to mention some special thickenings of this fascia. Thus, we have anteriorly the pubovesical thickening which is attached both to the body of the pubis and lower portion of the bladder. Then another thickening known as uterovesical is found binding

the lower portion of the uterus and upper portion of the vagina very firmly to the lower part of the urinary bladder. Still farther posteriorly is found another portion of the visceral fascia known as the rectouterine thickening which firmly binds the lower portion of the uterus and upper portion of the vagina to the wall of the rectum. That portion of this fascia through which the cervix passes is very firmly united with the fibrous portion of the cervix.

The parietal layer of the pelvic fascia passes around the anterior border of the levator ani muscles, blending in the midline, forming the superior fascia of the urogenital diaphragm.

The muscular layer consists of the levator ani and coccygei muscles, the muscular fibers being enclosed by the two layers of the endopelvic fascia, as just described. The coccygei muscles take their origin from the pelvic surfaces of the ischial spines and sacrospinous ligaments and are inserted into the lateral borders of the lower two pieces of the sacrum and upper two pieces of the coccyx. The levator ani muscles have a threefold origin. The anteroinferior fibers take origin from the posterior aspect of the body and superior rami of the pubes. The posterior superior fibers take their origin from the pelvic surfaces of the ischial spines. The intermediate fibers take their origin from the angle formed by the two layers of the endopelvic fascia, as previously described, or from the arcus tendineus or white line.

The insertion is as follows: the anterior fibers pass downward and backward, a few of them are inserted into the central point of the perineum; others are inserted into the wall of the anal canal between the external and internal sphincters. The intermediate fibers sweep around into the angle between the posterior wall of the rectum and upper end of the anal canal where they unite with their fellows of the opposite side and form a strong muscular collar about the gut. The posterior fibers pass backward and medially and are inserted into the median anooccygeal raphe and into the lower part of the coccyx.

The perineum which is the space lying below the pelvic diaphragm may be subdivided into two parts, the anal triangle and the urogenital triangle, the dividing line extending through the perineal body between the ischial tuberosities just anterior to the anus. The anal triangle has passing through its center the anal canal, having a space on either side known as the ischiorectal fossa which contains an extensive pad of fat, pyramidal in shape, through which extend vessels and nerves for the supply of the anal canal.

The urogenital triangle which is more important than the anal triangle to the obstetrician will be detailed more. This space contains the so-called superficial and deep pouches. The superficial pouch is the space enclosed between Colles' fascia superficially and the inferior fascia of the urogenital diaphragm deeply. Within this space we have the bulboavernosus muscle, the ischioavernosus muscles and the

superficial transverse perineal muscles and the vessels and nerves that supply these structures and the labia majora. In addition to these structures we have in this space the clitoris, the bulb of vestibule, Bartholin's glands and the terminal portion of the urethra and vagina. The deep pouch lies between the superior and the inferior fascia of the urogenital diaphragm. The superior fascia, which is a part of the endopelvic fascia, has been previously mentioned.

The inferior fascia is the fascia bridging between the inferior rami of the pubes and lies in the morphologic plane as the obturator membrane. Within this pouch we have the sphincter of the membranous part of the urethra, the deep transverse perineal muscles, the deep branches of the perineal nerves, dorsal nerves of the clitoris and the trunk of the internal pudendal arteries and a portion of the urethra and the vagina.

The lack of knowledge of the structure of the female pelvis is one of the fundamental causes of not recognizing complications during labor, the inability to correct this condition and to adequately repair injured tissues. To visualize the progress of labor one should know the muscular structure, the lymph and blood vessels of the uterus, the morphologic difference between the upper and lower uterine segments, the ligaments that attach the uterus to the walls of the pelvis, the parietal and visceral fascia which may blend or join with the muscular fibers of the cervix and uterus. How can one visualize the mechanism of labor without a knowledge of the levator ani muscles and fascia and their origin and insertion and their relation to the pelvic organs? Without this knowledge how can one hope to prevent injuries to the muscles and fascia of the superficial and deep structures of the perineum, and, if injured, repair them? The physiology and mechanism of the first stage of labor is better understood when it is known that the oblique muscular structures of the uterus are arranged in the form of a figure-of-eight around the blood vessels and are capable of powerful constriction, and, when contracted, produce intrauterine pressure.

The visceral fascia of the levator ani muscles is a part of the pelvic floor. This fascia in its morphologic development moors the uterus by the cervix to the pelvic wall. In this structural handiwork the pubovesical, the uterovesical and the uterosacral ligaments are mere thickenings of the visceral fascia and together attach or anchor the uterus to the bony structure. The visceral fascia joins or blends with the fascia of the fibers of the cervix. The visceral fascia attaches the bladder to the anterior surface of the cervix and lower part of the uterus and is considered with the uterus and rectum as pelvic organs.

The blending of the visceral fascia with the cervical fibers of the uterus and their fascia forms an important structure in the physiologic and mechanical part of labor. The fibers of the oblique or middle muscular layer of the uterus pass obliquely from the peritoneal surface of

the uterus to the endometrium. E. Hastings Tweedy says, "As these fibers approach the internal os, they turn almost at right angles, passing out and attaching into the pelvic wall as muscular tendons." He further says, "The circular fibers of the cervix likewise terminate in muscular tendons and they, too, largely attach themselves to the bony wall of the pelvis." Tweedy emphasizes the fact that "Involuntary muscular fibers may have muscular tendons as well as any other muscle, and if this were not so during the first stage of labor, the visceral fascia of the pelvic floor would be completely destroyed."

Dr. W. W. Looney, Professor of Anatomy, Baylor University, College of Medicine, says, "The visceral pelvic fascia serves as an aponeurosis for the oblique and cervical fibers instead of these muscle fibers having independent muscular tendons, which, Tweedy states, 'are inserted into the bony pelvic surface.' Probably as the visceral fascia passes to the uterus and cervix it blends with the fascial covering of the muscle fibers of these structures. This explanation appears more plausible when the visceral fascia is considered a part of an extension of the fascia covering the psoas muscle." Anatomists say that the dissecting of the individual fibers of the nonpregnant uterus is a difficult task, and that probably as the oblique fibers approach the cervix, these may become more circular and form what is known during labor as the contraction, retraction or Bandl's ring.

The uterus requires more space for the growing embryo about the seventh month of pregnancy. This space is supplied by the pushing down of the contents of the pregnant uterus against the internal os which causes these oblique fibers to dilate and retract, producing what is later known as the lower uterine segment. This segment is not necessarily taken from the cervix, for in the nonpregnant uterus the oblique and circular fibers are closely associated with each other as if they were compressed, and it is difficult to dissect them. A study of the anatomy of the uterus suggests that the lower uterine segment probably is developed from the fibers of the middle layer of the uterus which are present just superior to the internal os and bounded superiorly by Bandl's ring. This anatomic space of the uterus is the potential lower uterine or dilating segment.

The lower uterine segment is formed before the onset of labor. During the first stage of labor as the uterus contracts and forces the fetus against the internal os, the fibers of the lower uterine segment pull out and up on the circular fibers of the cervix, causing them to dilate. As has been said, "As the uterus contracts, the cervix dilates." This causes the shortening of the cervix which previously has not been very perceptible, yet the cervix may have been shortened by the irregular and painless contraction of the uterus before the onset of labor. As the cervix dilates, beginning at the internal os and extending to the external os, this progress is spoken of as effacement, and the gradual

progress is considered favorable during labor. The cervix may be completely obliterated or effaced before the external os is perceptibly opened. Especially in a primipara is this progress more favorable in the prevention of lacerations of the cervix than a thick or long cervix opening up in its entirety. During the first stage of labor, the fetus has not been pushed through the cervix, but rather the cervix has been pulled back over the presenting part, taking with it the bladder. As effacement takes place, the cervix is retracted over the presenting part, carrying with it the bladder, which previously has been a pelvic organ and now becomes and later will be an abdominal organ. This is an important point in the diagnosis of the close of the first stage of labor and the entering into of, and during the second stage of labor. This is a point to be considered if catheterization at this time is necessary. A full bladder during any period in labor may prevent full contractility of the uterine fibers. Bearing down while the bladder is a pelvic organ should be prevented to avoid tears of the uterovesical fascia and injury to the trigone and sphincter urethrae and urethra, which may cause a cystocele.

The pelvic floor is composed of the levator ani muscles and the visceral fascia which extends across the lower part of the pelvis, hammock-like in shape, and supports the nonpregnant uterus, and, also, during pregnancy, the head during labor. The course of the head during labor from the pelvic floor is downward and upward. A definite rule in the mechanism of labor is that the lowest point of the head is rotated to the front under the pubes by the levator ani muscles and the visceral fascia. The pelvic floor pushes the lower part of the head to the front, and the suboccipitobregmatic diameter which was in the oblique diameter now lies in the anterior posterior diameter of the outlet. It is the levator ani muscles, their shape and contractility which cause rotation during labor. The levator ani muscles and the uterine muscles oppose each other as they contract, which is clinically demonstrated as the head passes over the perineum and underneath the symphysis. Extension takes place while the uterine muscles contract; and, when ended, the head is flexed by the levator ani muscles pushing the head back. Probably the levator ani muscles lose their power to flex the head after the biparietal diameter has passed through.

The perineum is the structure that receives the force of labor after the head has passed through the pelvic floor. Lacerations can occur anywhere in the birth canal and may be submucous in character, located in the sulci or in and around the perineum, even including the sphincter ani. If the levator ani muscles and their fascia are not congenitally weak, or have not been overstretched, or have not been torn, these structures will support the uterus and prevent its prolapse. The uterus is supported by the pelvic floor and is not suspended from above.

A tear in the sulci probably will involve the anterior fibers and a few intermediate fibers of the levator ani muscles and their fascia. A destruction of the anterior and intermediate fibers and their fascia which are inserted into the central point of the perineum and anal canal and posterior to the rectum will deprive the rectum of this support. With the loss of this support and by the contraction of the sphincter ani the lower part of the rectum is pulled back forming a more acute angle which enlarges the ampulla, and this, in turn, will cause, during defecation, the feces to go against the posterior wall of the vagina rather than follow the anal canal and form or cause a rectocele. If the tear is in the anterior sulcus, the anterior fibers of the levator ani muscles with their fascia will be involved and destroy the support for the bladder and anterior vaginal wall and cause the base of the bladder together with the anterior wall of the vagina to sag and form a cystocele. The tear may begin in the vagina above the perineum, extending outward separating the muscles and fascial structures down to and including the sphincter ani. A median laceration through the perineal body does not involve the fibers of the levator ani muscles and their fascia except a few of the anterior fibers attached in the central point, and this would injure the perineal diaphragm but little. This tear would only partly destroy the supporting action of the superficial transverse perineal muscles, the bulbocavernosus and the urogenital diaphragm. Rupture of perineum alone will not cause prolapse.

Perineotomy or central incision of the perineum will prevent or control extensive lacerations. In a perineotomy only a few tendinous insertions of the levator ani muscles are divided, the muscular fibers themselves escaping because they are superior to the central point of the perineum. Lateral episiotomy may be preferred by some; but the danger of severing, if extensive, the fibers of the levator ani muscles and their nerves might later cause atrophy of the muscles. The stretching or "ironing out" of the perineum, the levator ani muscles and their fascia to prevent a tear is illogical and not a surgical procedure, and this is incompatible with the new era in obstetrics, that of prophylaxis. We teach a technic that will prevent infection. We emphasize the value of rectal examinations as preferable to the vaginal in order to prevent infections and to ascertain the progress of labor. I sometimes fear we are overzealous in making rectal examinations and consider these examinations as totally void of danger, yet there is a potential danger. Rectal examinations are safer than the vaginal, but it is not logical to advocate rectal examinations instead of the vaginal and then practice "ironing out" or stretching the perineum to avoid lacerations. If vaginal examinations are a source or an avenue for infections, then surely manual dilatation of the vaginal tissues is poor surgical procedure and probably more hazardous than several

vaginal examinations, and not only is this method a source of infection, but may rupture the fibers and fascia of the levator ani muscles and cause prolapse, cystocele and rectocele. Since the uterus is supported by the pelvic floor rather than suspended from above, this overstretching or breaking of the muscular fibers may cause weakening of the support of the uterus and result in a prolapse, while perineotomy causes less injury to the tissues and is not so great a source of infection.

CONCLUSIONS

1. The lack of knowledge of the structures of the pelvic tissues is one of the fundamental causes of not recognizing complications during labor, the inability to correct these conditions and to adequately repair injured tissues.

2. The visceral fascia serves as an aponeurosis for the oblique and cervical fibers of the uterus and cervix. As the visceral fascia passes to the uterus and cervix, it probably blends with the fascial covering of the muscle fibers of these structures.

3. During the first stage of labor the bladder is a pelvic organ; and after effacement, complete dilatation and retraction the bladder becomes an abdominal organ. Bearing down while the bladder is a pelvic organ may cause tears of the uterovesical fascia and injury to the trigone, sphincter urethrae and urethra of the bladder, and may cause cystocele. An injury of the uterovesical fascia may cause prolapse of the base of the bladder; and injury to the sphincter urethrae or Bell's muscles may cause urine to collect anteriorly to the base of the trigone.

4. A tear in the sulci will probably involve the anterior and a few intermediate fibers of the levator ani muscles with their fascia and deprive the rectum of this support and cause rectocele.

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MEDICAL ARTS BUILDING.

THE RÔLE OF THE THYROID IN DIFFERENTIAL DEVELOPMENT

BY E. P. SLOAN, M.D., BLOOMINGTON, ILL.

NO CHILD with abnormal thyroid function can make normal progress along the lines of differential development. The other ductless glands as well as the thyroid are influential in promoting normal development. The thyroid gland, however, is the pacemaker, the regulator of physical and mental differential development, the belwether or leader of the endocrine or ductless glands.

Few realize the very great prevalence of thyroid insufficiency in the human being, and the resulting effect upon health and character. Thyroid insufficiency ranges through all degrees from entire absence of thyroid function which results in utter idiocy, to the extremely mild forms of thyroid deficiency, in which the patient shows only very mild or almost imperceptible, deviations from the normal.

The cretin or the individual totally deprived of his thyroid gland is an idiot and a dwarf. He will never, no matter how long he lives, measure more than three feet in height, and will, throughout the course of his existence, remain an infant in mentality.

I wish to call your attention especially to the influence of thyroid deficiency in the mother upon the differential development in the later life of the child. Let me explain briefly the terms "gross" and "differential" development as used in this discussion.

Gross development refers to increase in size. Differential development includes all the changes, both physical and mental, that occur in the process of evolution from the time of conception until the individual reaches full maturity. It includes not only all the embryologic changes that occur during fetal life and such later phenomena as the eruption of teeth, the ability to talk, the change of the voice, the appearance of a beard, sex characteristics, etc., but it also includes the development of the intellect, the power to reason or think with judgment, and the development of character qualities. Thus, differential development is not complete at puberty but at full maturity. Different characteristics normally develop in successive stages. Some belong to fetal life, some to childhood, some to the "teens" and some to the twenties. Memory, imitative faculties, affection impulses develop at an early age; conscious sex impulses develop about the time of puberty. Imagination develops early; control of harnessing of the imagination comes later as judgment and reason act as a bridle on the imaginative faculties.

Almost automatic responses to the environment in early childhood normally yield to control by the reason or the will late in the teens. After adolescence during young manhood and young womanhood comes the final and most important stage of development from the standpoint of citizenship. Character qualities become a part of the individual himself. Truthfulness, honesty, justice, kindness, courage and judgment developed within himself, a part of himself, govern every impulse, decide every action. He is dependable, what we call "settled." With the prophet he can say, "When I was a child, I spake as a child, I understood as a child, I thought as a child, but when I became a man, I put away childish things."

Normal differential development is a continuous process by which physical, intellectual, mental, and moral perfection is attained. The later stages of differential development follow the early stages, the human baby that is born with a normal differential development is already well on the road to healthful maturity and has a much better chance in the race of life than the baby whose development at birth is retarded.

It has long been known that thyroid function must be effective in the early stages of the life cycle if the organism is to reach its normal development. From the standpoint of perfect differential development in the later stages adequate thyroid function is of more importance during fetal life than during any later stage of development. The baby born with retarded development may, if provided with adequate thyroid function at an early age, apparently reach the normal, but he can never quite reach his inherent possibilities. Unfortunately, the result of thyroid deficiency in the mother may not be obvious until the child has reached the age of adolescence, too late to speed up differential development.

The cretin alone is not the index of economic loss in the community. He is but the torch-bearer of the incompetents, the absolute zero of intelligence. In his wake and outnumbering him many times, follows the army of cretinoids—the weak-minded and imbeciles, the sluggards and misfits, the misshapen and deformed, the deaf-mutes and the degenerates, the criminals, unfortunate representatives of every phase of decadence from the zero of the cretin to degrees of mentality and physique barely below the normal.

It is impossible to estimate the prevalence of the milder forms of physical and mental underdevelopment due to lack of thyroid function. Many of them attain almost normal physical and intellectual power but are lacking in moral and character qualities.

According to Wm. Nelson, of St. Louis, 85 per cent of youthful criminals have an intelligence quotient of above 50 and below 81.

According to Hirschfeld, "Of the eleven million recruits examined in the late war, 45 per cent were found to have a mentality of not

much over twelve years." True morons (adults with a mentality age level of from seven to twelve years) are generally peaceful and law-abiding, readily satisfied with conditions as they exist, but prone to idleness, and may easily be led into mischief. The real menace is the "psychopathic personality" or the "constitutional inferior," "morally rather than intellectually inferior," whose vicious tendencies are easily veiled, "until by heedlessness or lack of foresight, he leaves detectable evidence of his crimes." John Wilkes Booth, who shot Lincoln was a "psychopathic personality." Davy Herold, the half-wit who was with him when captured, was a moron dominated by Booth.

I do not wish to infer that all criminals are morons or subnormals. Jesse James was perhaps a normally developed individual. He was reared in an atmosphere of passionate hates, resentments and suspicions. He perhaps reacted normally to the cruel, vicious, madly lawless environment of his boyhood.

The Loeb-Leopold case, however, presents another angle. Environment alone cannot explain their criminal characters. They had reached a physical and intellectual development far beyond the average. But their moral development was greatly retarded. Differential development had not progressed beyond the age level of fourteen years.

Is retarded or defective differential development in these cases due to conditions within our control? Shall we leave this problem to psychologists, educators, religious enthusiasts, social workers and faddists of all kinds, or shall we give it serious thought and consideration? The retarded development in many cases can be shown to be the result of thyroid insufficiency in early life. The large group of defectives and morons, those who show slight deviation from the expected standards, who are slow to learn, finding themselves invariably at the foot of the class, who are given to truancy, who seem normal but are not, who promise but do not keep their promises, who try but do not succeed, cannot hold their jobs, are a burden and source of constant anxiety to their parents, are prone to yield to criminal impulses, these constitute the greatest social and civic problem that confronts us today.

Can the medical profession, in the light of present knowledge, by preventive measures, especially during pregnancy, reduce the incidence of criminals and dependents from incompetency, psychopathic personalities, idiocy, insanity, etc.? Can we go further and reduce the incidence of morons and high-grade mental defectives? Can we go even further and by prevention of thyroid deficiencies in pregnant mothers and growing children enable the coming generation to more nearly approach perfect differential development?

The results attained by appropriate treatment directed toward speeding up the differential development in children attending special schools for backward children are very encouraging. There is hardly a medical practitioner who does not see several backward children

each year; about 95 per cent of all these children are appreciably improved by thyroid medication, but in no such case can one hope to attain the results possible by earlier attention to the deficiency.

Thyroid insufficiency may be due to:

1. The faulty functioning of the thyroid gland itself.
2. Mineral deficiency in the body.

The human body requires over 13 mineral elements, some of which are iron, calcium, magnesium, iodine, sulphur, etc. The most important of these, from the standpoint of thyroid function, is iodine. But deficiency in any of the above minerals may interfere with normal thyroid function. Some of the causes of mineral deficiency are,

(a) Lack of mineral elements in the nutritional supply.

(b) Defective assimilation whereby the mineral elements in the nutritional supply are not utilized.

(c) Excessive elimination of one mineral element as the result of an effort to eliminate another. The most common deficiency of this type is an iodine and sulphur deficiency caused by an excessive amount of magnesia and calcium in the water supply.

3. Infections are of some importance, because they produce disturbances in assimilation.

SIGNS AND SYMPTOMS

I. *History*.—First, and of most significance, is the history. A family history of goiter, idiocy, obesity, mental deficiency, enteroptosis, criminality, degeneracy, late teething, walking, or menstruation; and a personal history of the above plus weight history, school record, temperamental peculiarities, intelligence quotient, etc.

It is often difficult to obtain the above family history even though the patient realizes its importance. The incidence of demonstrable thyroid insufficiency in the third generation of goitrous individuals is usually more than 50 per cent.

II. *Obesity*.—A family history of obesity is of slight significance unless associated with a history of subnormalcy in the family.

III. *Enteroptosis*.—As a family trait it should be considered. I have been convinced that enteroptosis in some cases is the result of retarded differential development in early fetal life by observation of many cases like the following:

One mother, with adenomatous goiter, gave birth to two extremely enteroptotic children both dull mentally. Her hypothyroidism was discovered and she took thyroid extract regularly for four years during which time two children were born that are not enteroptotic and are very active mentally. Then her goiter was removed and she discontinued thyroid medication. Two years later she gave birth to the fifth child that is subnormal mentally and extremely enteroptotic. When this fifth child was six months old, she sought treatment for well-marked myxedema.

I know of four enteroptotic children born to thyroidectomized mothers, while older children from the same parents are not.

IV. *Infantilism*.—The possibility of hypothyroidism should be considered when an expectant mother presents an infantile physiognomy, small teeth, receding lower jaw, small stature, undeveloped breasts and secondary sex characteristics, obesity, thin hair, thickened skin, puffed face or abnormally thick broad tongue.

V. *Sluggishness*.—The pregnant woman normally becomes overenergetic, overactive, and overambitious during the early months of pregnancy.

The pregnant woman who becomes apathetic, increases in weight rapidly, has puffiness of the face and swelling of the legs, who is inclined to become inactive, should be suspected of being hypothyroid.

VI. *Vomiting*.—The greater majority of cases with persistent vomiting of pregnancy can be shown to be deficient in thyroid function.

VII. *The Breasts*.—Lack of evidence of colostrum or secretion in the breasts the last few days of pregnancy almost always accompanies hypothyroidism. Suppression of milk after confinement is an indication that should be considered.

BASAL METABOLISM

The basal metabolism rate is generally estimated in the same way and given the same interpretation during pregnancy as if the woman were not pregnant. The accepted normal variations, as determined by oxygen consumption, are based upon established ratios of oxygen consumption to the factors of height, weight, age and sex. These ratios have been determined with sufficient accuracy to be generally accepted in medical literature and no doubt serve their purpose well in the estimation of variations from normal basal metabolism except in cases of pregnancy. Fever, digestion, exercise, etc., are factors that influence the rate of oxygen consumption and must be given consideration in determining the basal metabolism rate. Pregnancy is another factor and should receive due consideration. If we are to properly estimate the rate for the pregnant woman, we must adopt higher ratios of oxygen consumption and give more consideration to such factors as pregnancy, fever, vomiting, digestion, emotional states, etc.

While most authorities agree upon an increased rate of oxygen consumption, the normal increased rate during pregnancy, or the rate for different months of pregnancy has not been even approximately standardized.

Many cases of hypothyroidism in pregnant women have been overlooked because their metabolic rates have been reported normal, no attention having been paid to the fact that the normal reading during pregnancy is probably twenty or thirty points higher than would be found in the same woman if she were not pregnant. For instance, a

plus ten during the third month of pregnancy might have been a minus fifteen before conception took place.

We know that the oxygen consumption rate runs a very irregular course during pregnancy. There is no other condition known in which there is such a great variation both as compared to the nonpregnant and the degrees of change of rate in the various months of pregnancy. However, we are convinced that it is always increased; the hypothyroid woman will nearly approach, or even surpass the accepted normal rate, and the woman with a normally functioning thyroid will give a high reading, sometimes reaching a point reported as plus 40 or 50 per cent. About one-half or more of the cases will run such a varied course of metabolic rates, with such sudden rises and falls, that not even an approximate estimation can be set down as the usual one, but in about 40 per cent of the cases we have found a fairly constant reading. Assuming the normal nonpregnant reading, we find a gradual increase with the onset of pregnancy, which at the third or fourth month reaches an increase of about twenty above the nonpregnant reading or plus twenty. This which is so often accepted as high, we believe to be normal under the existing circumstances. From the third or fourth month to the termination of pregnancy, there is no further gradual increase, but rather the maintenance of a fairly constant rate which averages twenty to twenty-five points higher than was found before pregnancy occurred. We do, however, find sudden increases for perhaps three or four days, such as plus fifty or sixty, but they usually recede and remain within limits of the constant level. From this we conclude that if the basal metabolic rate is to be taken as a criterion or guide for treatment, new tables with higher percentages should be adopted as well as further investigations made of the probable factors which cause such great variations in the basal metabolism rate in pregnancy.

TREATMENT

Treatment consists largely in the administration of thyroid and in the correction of mineral deficiencies. Valuable adjuvants are phototherapy, change of climate, hygienic measure, etc.

In the administration of thyroid, large doses are rarely necessary. The amount required daily may usually be given in one dose. One-half to one grain of thyroid extract per day is sufficient for the usual case.

The correction of mineral deficiencies requires more thought and study. Fortunately iodine the most important mineral is easily assimilated in almost any form. It may be given in the form of Lugol's solution, five to ten minims twice a day. A more attractive preparation is one-tenth grain of iodoform in tablet form. It is almost tasteless and this dose is equal in effect to five minims of Lugol's solution.

When thyroid medication is poorly tolerated, investigation will usually show that some mineral deficiency exists. In my experience, the most frequent one except iodine is sulphur. Sulphur, phosphorus, iron and some of the other minerals are not absorbed in the natural state. Sulphur may be given three times daily in the form of one grain of ichthyol with glycerin in capsule, with fair prospects of absorption. In calcium deficiency one to two grains of calomel in divided doses once a week and calcium lactate 90 grains per day seems effective. Light therapy is a valuable adjunct. There are several preparations on the market containing varying combinations of the different minerals in a form that the manufacturers claim to be assimilable.

THE TEACHING OF POSTGRADUATE GYNECOLOGY

BY WALTER T. DANNREUTHER, M.D., F.A.C.S., NEW YORK

(Professor of Gynecology and Director of the Department, New York Postgraduate Medical School and Hospital)

IN DISCUSSING the pedagogic problems involved in the subject under consideration, it is necessary to differentiate three groups of candidates for postgraduate instruction: (1) those who take a special internship in obstetrics and gynecology after completing a general intern service; (2) graduate interns who are selected by universities, foundations, etc., for supplemental courses, embracing from one to three additional years; and (3) practicing physicians who present themselves for concentrated instruction after a variable number of years in practice, general, surgical, or gynecologic, seeking to extend and improve their diagnostic and therapeutic resources.

In striving for his degree, the undergraduate's interest is mainly academic. He has not a proper conception of the relative importance or clinical significance of the scientific data that he is absorbing, and often suffers from an intellectual indigestion. He acquires his clinical experience in gynecology chiefly in the dispensary, where the number of students and limited time necessarily restrict the development of his diagnostic ability and therapeutic judgment. Witnessing pelvic operations from the remote benches of the amphitheatre, he sees a great deal of hardware and dry goods, but learns little gynecologic pathology. The refinements of technic are concealed, although the apparent safety and simplicity of the procedures are alluring. Consequently, the finished product of the undergraduate school, even without subsequent hospital training, does not hesitate to wave sharp curettes in the uterine cavity and attempt vaginal plastic operations. In some large cities such practices by the inexperienced are facilitated by the existence of many uncontrolled private sanitarium and

open hospitals. One way to mitigate this evil is to curtail the undergraduate demonstration of major surgical operations.

It is distressing to note that gynecology has not yet been divorced from the department of general surgery in a number of large hospitals. Such a state of affairs prevails today in three prominent institutions in my own city. Two of them operate separate out-patient gynecologic clinics, but neither has produced a trained gynecologist in the past twenty years. Hospitals tolerating this anomalous arrangement are failing in their duty to their interns, to the medical profession, and to the public. The departmental fusion of obstetrics and gynecology is not only logical but highly desirable, because the intelligent practice of one is dependent upon a thorough knowledge of the other. But there is no more reason for the absorption of the gynecologic operative material by the department of general surgery than for the appropriation of all patients requiring otolaryngologic operations. In the latter specialties, as well as our own, the ability to do operations is relatively unimportant, as compared with the proper selection of cases for operation and expertness in applying nonoperative treatment. It requires more skill to cure diseases of women by conservative measures than by operation, and it is far more creditable to the gynecologist, and certainly to the patient's advantage, if symptoms are relieved by office treatment rather than by hysterectomy. During the year 1928, 23,157 visits were made to the gynecologic clinic at the New York Postgraduate Medical School and Hospital. This number included 2,864 new patients, of which only 228, about 8 per cent, were operated upon. Of course a few drifted to other institutions and a small number refused operation, but the average of loss was no greater than in private practice. That many general surgeons are skilled pelvic operators is freely admitted. On the other hand, their capacity for duly considering the adaptation of treatment to pelvic symptomatology, the effects of particular operations on the child-bearing function, and the important factors that subsequently influence the patient's psychologic stability and domestic happiness, is open to question. As a rule, the background of a wide obstetric experience is lacking. How many utilize diathermy, the electrocautery, negative galvanism, pessaries, cystoscopy, radium, etc.? Those who can find the time and have the inclination to accord all these items the attention they merit, while carrying on a general surgical practice, are to be congratulated. I have no inclination to read an indictment of the general surgeon as a pelvic and plastic operator, but I have the temerity to challenge his teaching of gynecologic therapy.

An intern is but a medical student with a degree, which allows him to assume certain responsibilities while pursuing his clinical studies. He has a right to assume that the members of the attending staff will guide his instruction and encourage him to cultivate habits under their

supervision which will contribute to his future professional success. He is entitled to practical training on a separated obstetric and gynecologic service as the first step in his postgraduate instruction. During the past few years there has developed a crystallization of sentiment among teachers that the departments of obstetrics and gynecology should be amalgamated in all teaching institutions. Why not in all hospitals?

An intern securing a service in a hospital devoted exclusively to diseases of women is fortunate, as these institutions are few in number and such opportunities are necessarily limited. Hospitals of this character usually make their selections from aspirants who have completed a general intern service elsewhere, and thus continue the training of men who already are fairly well qualified for private practice.

Up to the present time, most university medical schools providing postgraduate instruction have sought and chosen the more brilliant students for a prolonged apprenticeship, eventuating in either a competent research worker or a capable teacher. Perhaps the Mayo Foundation best exemplifies this system. Dr. Louis B. Wilson, Director of the Foundation, is authority for the statement that after an existence of fourteen years, 70 per cent of its graduates are teachers. Parenthetically, it may be noted that there is no separate gynecologic department in the Mayo Clinic. The candidates for these intensive courses are usually between twenty-five and thirty years of age, have had no contact with patients on an individual basis, and sacrifice little in continuing their institutional studies. The research worker and teacher are essential to progress in the science of medicine, and the necessity for ultrascientific postgraduate instruction in their development is unquestionable. But whether men of this type have a real inclination and the personal qualifications for private practice is problematical.

All physicians of long experience have discovered that irrespective of the specialty practiced (except general surgery), the majority of patients demand relief from minor and nonoperable ailments. Even when an operation is under advisement, sound surgical judgment is just as important as the details of technic. It is therefore quite natural that many practitioners frequently realize the desirability of postgraduate work, after a few years in the hard school of practical experience. The New York Postgraduate Medical School and Hospital was founded in 1882, with the chief purpose of providing facilities for such postgraduate studies. In the forty-seven years of its existence, 27,158 doctors have registered as matriculates. If it is logical to assume that the postgraduate student's requirements reflect the deficiencies of his undergraduate and intern instruction, my observations seem to justify the inference that the undergraduate student has had too much mental exercise and training of the memory, with too little

synthesis of ideas, and an unduly restricted practical experience in gynecology. During the ten-year period from June 1, 1919, to May 31, 1929, 7,291 matriculates registered in the school. Of these, 1,290, or 10.7 per cent, took courses in gynecology. I have utilized the statistics of a recent ten-year period rather than those of the past forty-seven years, because they are more enlightening in respect to the need of the present-day practitioner. Only three other departments registered more matriculates than the department of gynecology: otolaryngology 1,595, urology 1,359, and laboratory 1,319. In other words, more physicians with actual experience in the trials and tribulations of private practice voluntarily sought postgraduate instruction in gynecology than in medicine, surgery, pediatrics, or neurology. Of the matriculates taking gynecologic courses, 766 stayed one month, 379 two months, 134 three months, and 11 six months; these figures indicate the actual demand for intensive instruction compressed within as short a time as possible. One hundred and eighty-three took the seminar, a schedule which entirely fills the student's time from 9 A.M. to 5 P.M., six days a week. This comprehensive teaching schedule provides for cooperation with the departments of pathology, biologic chemistry, proctology, and dermatology. The remaining 1,107 took one or more special courses: diagnosis and office treatment, operative gynecology on the cadaver, female cystoscopy, endocrinology, etc. Of course, many of the latter group also took special courses in other departments. Despite the sentiment in favor of long postgraduate courses, culminating in a finished specialist with an additional degree, the fact remains that many active practitioners have no specialistic ambitions, and cannot afford the sacrifice of time and expenditure of money incidental to a prolonged absence from home. Yet they are sufficiently conscientious in the realization of their deficiencies to make every endeavor to improve their professional skill. Leaving their practices and curtailing their incomes, even for a short time, it is hard to believe that such men would unjustifiably pretend to be something which they are not. Our school confers no degrees, grants no diplomas, and issues no certificates, beyond a written statement on request, that the matriculate has taken a certain course of instruction. In each instance an effort is made to adapt the curriculum to the past experience, desires, and ambitions of the individual, after an inquiry to determine his qualifications. Admitting the advantages of long courses for potential specialists, it also seems logical to make some provision for the man who may not be intellectually brilliant or desirous of specializing, but who feels the need of "brushing up." It must be conceded that practice in the field of gynecology does not involve the use of so many diagnostic refinements, instruments of precision, and highly specialized technic, as a few of the other branches of medicine. Hence, the directors of some other departments are in a better position to demand

that their matriculates spend more time in the pursuit of their studies. From the pedagogic standpoint, an ideal for the future in the gynecologic department would be the limitation of courses to those matriculates who are planning to specialize and can remain in the school for at least six months, but this is impracticable until undergraduate and hospital training equips the practitioner in such a way that the demand for short courses will be materially diminished.

CONCLUSIONS

1. There are three groups of candidates for postgraduate instruction in gynecology: those who seek an internship in special obstetric and gynecologic hospitals; recent graduates who take supplementary intensive courses leading to an additional degree; and physicians in active practice who voluntarily present themselves for postgraduate instruction.

2. It is the business of undergraduate schools to prepare their students for the practice of medicine.

3. The teaching of the refined technic of major surgical procedures might well be curtailed in undergraduate schools.

4. A special gynecologic service should be conducted in all hospitals.

5. The departmental fusion of obstetrics and gynecology is highly desirable.

6. Fellowships and long courses of more than one year produce more teachers and research workers than practitioners.

7. At the New York Postgraduate Medical School and Hospital, during the past ten years, more matriculates have sought postgraduate instruction in gynecology than in any of the other branches of medicine, except otolaryngology, urology, and laboratory.

8. Of the 1,290 matriculates taking gynecologic courses during the past ten years, 59.4 per cent stayed one month, 29.4 per cent two months, 10.4 per cent three months, and 0.8 per cent six months.

580 PARK AVENUE.

A CRITICAL STUDY OF 335 HYSTERECTOMIES

(DONE FROM SEPTEMBER 1, 1928, TO SEPTEMBER 1, 1929)

BY JAMES E. DAVIS, M.D., AND PAUL L. CUSICK, M.D., DETROIT, MICH.

HOSPITAL RECORDS

THE scientific attitude in hospital work would be measurably improved if there were an obligatory requirement for a yearly, five-yearly and ten-yearly group study of at least 5 per cent of the major standardized surgical operations. Improved studies of cases would be a natural result; a more efficient system of record making would follow; availability of the records would be improved; a worth-while follow-up system would be supported. Through all this work there would be developed the use of important common factors which would effectively aid in the welfare of patients and efficiency of surgical services.

The clinical records studied, in almost every instance, have given no worth-while record of constitutional data. Further investigation of hospital records in other cities has shown that the staff is not required to make adequate records of facts pertaining to the patient's constitution. Necropsy findings are repeatedly proving that many patients are being numbered as mortalities because they were not properly safeguarded before operation by carefully directed constitutional studies. No better example can be cited than the patients with vascular and organic scleroses. Such patients when subjected to anesthetics from one and one-half to three hours are demised in from four to eight or nine days. The clinical reasons for the deaths may appear inadequate, but pathologic examinations reveal an astonishing frequency of vascular and organic scleroses of both hereditary and acquired origin.

Clinical history records very frequently show deficient statement of the preoperative diagnosis. The descriptive data concerning the operation in many instances is concerned more with the operative technic than with the living pathology observed or exact statement of the tissue removed. This type of record is of little value to the patient or the surgeon six months later when the patient declares no relief has been obtained, for then the busy surgeon has forgotten exactly what was done within the patient's abdomen, and on consulting the record finds only the technic described in the last operation.

The follow-up problem involves expense and painstaking effort, which has no immediate tangible value in hospital financing. Its value must be credited to the patient and the doctor. Certain obligations, however, are arising which make it mandatory that patients shall be

followed through periods of many years. The surgical, as well as the x-ray and radium, treatment of cancer can only be evaluated by knowing the patient's condition five or more years after treatment if curative data are desired. Even the after-history of the patient who has had only an appendix vermiformis removed may often be profitable information. And even the finest technic in perineorrhaphy may need to be followed to determine results.

EFFICIENCY OF OPERATORS

Clinical and pathologic studies show too large a group of inadequately trained operators. Technical efficiency is surprisingly good, but differential diagnostic knowledge and appreciation of unexpected pathologic conditions are often inferior. The surgery of these operators is a real menace to the patient's safety, except on occasions when the expected changes are present.

Observations concerning the most efficient and experienced operators show all too frequently insufficient attention for the safety of the patients. When two ways are possible for the patient to be directed in getting well the one of risk is often chosen for no better reason than it is the surgical way. The operator who feels he must have the greatest number of hospital patients is too frequently disposed to this practice.

It is quite exceptional, even among the better class of surgeons, to find many who are good readers of gross pathologic tissue changes, and it is quite exceptional to find a single surgeon in a large city who can read histopathologic tissue changes. To determine whether a uterus or a kidney should be removed calls for knowledge of living pathology in addition to judgment upon operative indications; and what better opportunity is there to improve and fortify this knowledge than is afforded by close and careful gross and microscopic studies of the tissues removed?

MATERIAL STUDIED

The data for this study have been gathered from 335 patients upon whom hysterectomies have been performed in six different hospitals by thirty-five different operators.

The gross and microscopic tissues afforded a unit study, divided into two parts; one part, consisting of 256 cases, was personally studied by the senior author; the remaining 79 cases by O. S. Brines, and then reviewed by us in this paper. Gross specimens in the majority of instances were studied by serially sectioning the entire tissue. Permanent mountings were made of a serial cross-section from each separate type group by curing in Kaiserling III solution.

Histopathologic examinations were made of two to four selected sections from each gross specimen, and certain details of the study were followed as uniformly as possible throughout the entire group of cases.

In uteri involved in fibromyomatous newgrowths, changes found in the myometrium, endometrium and cervix were recorded. The common factors in the architecture of the tumor masses, together with changes denoting inflammation, degeneration and malignancy, were observed and described. In uteri without newgrowth changes particular attention was given to recognition of pregnancy, infection and degenerative changes, particularly of the vascular structures. In specimens exhibiting malignant newgrowth, extent of involvement, degree of malignancy and changes in the uterus of a general character were noted. Uterine adnexal tissues removed were routinely examined for existing pathology.

ANALYSIS OF CASES

The civil and social conditions of the patients represent a mixed group from one city hospital and five private hospitals. Ninety-six and five-tenths per cent of the patients were married women; 56 per cent of these patients have given birth to one or more children.

Two races were represented, in the following proportion: white 69.1 per cent, negro 30.9 per cent.

The average of age incidence of the white patients was 39.65 years and of the colored patients 33 years.

CONSTITUTIONAL DATA

The records have been found almost of no value for this information. Fatness and leanness of the patients were only occasionally noted. Remarks concerning body build were seldom found. Heredity received no attention. Temperamental developments were scarcely mentioned.

SYMPTOMATOLOGY OF FIBROMYOMATA (SUBJECTIVE SYMPTOMS)

Abdominal and pelvic pain, while not recognized as a symptom by most textbooks, occurred much more frequently in our series than any other symptom; while other effects as menorrhagia, leucorrhœa, etc., when they occurred were earlier in their appearance. It seemed that it required the presence of actual pain to drive these patients to a physician and, subsequently, to operation. Pain in the abdomen occurred in 65 per cent of this series of cases and was a chief complaint in 54 per cent. Backache was present in 33.1 per cent and was the chief complaint in 16 per cent. The mechanism of pain production was of two types. First, that due to pressure upon nerves and plexuses of the region; and second, irritation produced by the tumor in the uterus itself. Both types usually were more severe at the menstrual period due probably to the accompanying hyperemia.

Menorrhagia, given as the most frequent and important symptom by Graves,¹ Kelly² and others, occurred in about one-third of the cases

and as the chief complaint in but 6 per cent. Menorrhagia and metrorrhagia were more frequent in the submucous type of growth. Metrorrhagia occurred in 24.6 per cent of our cases.

Leucorrhœa occurred in 33.18 per cent of this series of cases. This symptom is produced according to Fulkerson³ by a hyperplastic endometrium, which in turn is due to passive congestion.

Pressure symptoms, such as frequency and constipation, were variable and dependent on the size and position of the growth.

Dysmenorrhœa, given as the earliest indication of fibromyomata, by Kelly,² was found in 11.6 per cent of our cases, being the chief complaint in but 5.4 per cent.

DETAILED LISTINGS OF SUBJECTIVE AND OBJECTIVE SYMPTOMS IN 233 CASES OF FIBROMYOMATA

A. SUBJECTIVE	PER CENT OF ALL CASES
1. Pain in abdomen or pelvis	65.0 (Textbooks do not
Chief complaint in	54.0 list pain as a pre- dominant symp- tom)
2. Tumor in abdomen	40.8
Chief complaint in	29.0
3. Backache	33.1
Chief complaint in	16.1
4. Leucorrhœa	33.18
Chief complaint in	6.7
5. Menorrhagia	31.3 (Almost all writers
Chief complaint in	7.6 list menorrhagia and metrorrhagia as chief symp- toms)
6. Metrorrhagia	24.6
Chief complaint in	16.0
7. Dragging—sense of weight	22.9
Chief complaint in	6.2
8. Frequency of urination	25.0
Chief complaint in	2.2
9. Constipation	21.9
Chief complaint in	1.8
10. Irregularity (menstrual)	20.6
Chief complaint in	1.8
11. Dysmenorrhœa	11.6
Chief complaint in	5.4
12. Burning on urination	13.0
Chief complaint in	1.35
13. Headache	11.6
Chief complaint in	2.7
14. Retention of urine	2.7
Chief complaint in	0.45
15. Incontinence	0.9 (2 cases)
B. OBJECTIVE	PER CENT OF ALL CASES
1. Tumor palpable in abdomen or pelvis	47.0
2. Cardiac disturbance	13.35
3. Anœmia	9.4
4. Leucocytosis	9.4
5. Thyroid disturbance	8.9

AGE INCIDENCE

The age incidence for the group of fibromyomata is of greatest significance between 30 and 50 years. From 20 to 30 years there occurred 11.6 per cent; 30 to 40 years 43.4 per cent; 40 to 50 years 39 per cent of the cases. Between 50 and 60 years only 5.4 per cent and after 60 years the number reached almost the vanishing point or 0.6 per cent. The average age of white patients exceeded that of colored patients by 6.65 years.

Correlation of the most common factors, in fibromyomata, will yield very usable data to give a very high average of correct diagnosis:

Abdominal or pelvic pain was present in 65 per cent of all cases and as a chief complaint in 54 per cent of all cases, taken together with backache which occurred in one-third of the patients, and then associated with palpable tumor formations which had a 47 per cent frequency, should be taken as the most significant grouping of symptoms.

Bleeding (menorrhagia, metrorrhagia, with associated congestion and dysmenorrhea) and the correlated cardiopathology, anemia and thyroid dysfunction formed the second grouping and next most frequent symptoms.

The triumvirate of fibromyomatous symptoms may be recorded as *pain, tumor and bleedings*.

OPERATIONS

In this group of 335 hysterectomies there has been either total or subtotal resection of the uterus without adnexal structures, or with parts or all of the adnexal structures. Myomectomies are not included. In 72.16 per cent of cases the uterus was removed because of the presence of fibromyomata. Malignancy was found in 6.09 per cent of cases; retained products of pregnancy in 6.4 per cent of cases; and inflammatory changes with associated hypertrophy and hyperplasia in 26.8 per cent of cases. (Endometrial infection 15.5 per cent; myometritis 4.5 per cent; cervicitis 5.8 per cent.) There were also three cases of tuberculosis of the endometrium; there were ten other uteri with only arteriosclerotic changes, and sixteen of descensus.

The treatment of fibromyomata, so far as this material is concerned, has been entirely surgical. There is not a single instance in the records of x-ray or radium treatment having been given for this type of pathologic change. The great majority of specimens show multiple tumor masses of medium size, which would seem to indicate, when compared with the tumors removed in the earlier period of hysterectomies for fibromyomata, that a better control of this condition is being obtained. However, a considerable number of advanced degenerations in many cases have been observed in this group. The type of operation performed was predominantly subtotal for the removal of fibromyomata. It has seemed that from the number of infections found in the

tissue adjacent to the cervical stump, that total extirpation would have been better treatment. James F. Baldwin⁴ and others have insisted that the cervical portion of the uterus should be removed as insurance against continued infection and possible malignancy, and that its removal does not necessarily interfere with vaginal and bladder support. The incidence of safety in this series of cases is expressed in a mortality rate of 4.68 per cent.

The operations for malignancy would appear to have been unsatisfactory, particularly where the cervix was involved. The specimens show that sections were made through the cancer masses and no particular attempt had been made at removal of all the cancerous tissue, or the use of supplementary radium and x-ray treatment. The work of Adler⁵ of Vienna, and his results in vaginal hysterectomy followed by radium and x-ray treatment of cancer of the cervix are exceedingly gratifying and should be known to every operator. The work of Bonney,⁶ of England, and others, using the Wertheim technic in all stages of cancer of the cervix has been attended by as low as 15 per cent to 18 per cent mortality. Again, the records of radiologists and roentgenologists like Kelly² and Burnham,¹¹ Schmitz,⁷ Regaud⁸ and Strachan⁹ have been excellent, and the results of their well-standardized technic in treatment should be made known to all operators for this type of malignancy.

PATHOLOGY—GROSS AND MICROSCOPIC

Tumors.—In 72.16 per cent of the uteri fibromyomatous newgrowths were observed, and in only a few instances were these growths not visible for gross recognition. A small number of seedling or microscopic tumors was observed.

Eighty-six per cent of the fibromyomata were multiple. This finding will suggest the futility of myomectomy as a treatment.

Fifty-seven per cent of all the fibromyomata gave gross evidence of degenerative changes.

Fourteen and three-tenths per cent of all the fibromyomas were undergoing liquefaction, 3.5 per cent exhibited red degeneration, 7 per cent calcification, 3.1 per cent were necrotic, 2.5 per cent were infected and 0.6 per cent malignant (sarcoma).

Uterus.—In 65 per cent of all cases there was atrophy and displacement of the myometrium. (If sections had been taken from all parts of the wall, this percentage would be much too low.)

Vascular sclerosis was a very constant finding in 80 per cent of the tissues. Diffuse fibrosis was observed in approximately 60 per cent of specimens. Hyperplastic and macerated endometrium was present in approximately 70 per cent of all tumor cases.

DISEASE ENTITIES OTHER THAN FIBROMYOMATA

Only two types of pathologic changes were found in which fibromyomata were not present in some of the cases.

Hydatid mole occurred in two uteri in which there were no fibromyomata; one tubal pregnancy was unassociated with fibromyomata.

Endometritis, descensus uteri, recent pregnancy, marked vascular sclerosis, cervicitis, myometritis, sarcoma, carcinoma, adenomyosis and tuberculous endometritis occurred more or less frequently in association with fibromyomata.

In the uteri without fibromyomata there were 24 instances of endometritis; 15 of descensus uteri without associated fibromyomata; 15 recent pregnancies without fibromyomata; 19 cases of marked vascular sclerosis of the uterus; 15 cases of cervicitis, one of which showed an associated recent pregnancy; there were 7 malignancies of the cervix and fundus without fibromyomata; 5 instances of adenomyosis without fibromyomata; and 2 cases of tuberculous endometritis not associated with fibromyomata.

The ovarian pathology, which is based entirely on the adnexal tissue removed, occurred in 11.3 per cent of all cases; salpingitis occurred in 8 cases not associated with fibromyomata.

The age incidence of the pathology other than fibromyomata corresponds very closely with that of fibromyomata, being 33.5 per cent from 20 to 30 years; 23.5 per cent from 30 to 40 years, and 27.5 per cent from 40 to 50 years. The incidence from 50 to 60 years was 8 per cent, and from 15 to 20 years and beyond 60 years 4.5 per cent.

DISCUSSION

Historical Development of Hysterectomies.—Hysterectomy is an operation of recent development. In earlier times leeching was considered very good treatment. Absorbents were used later for all types of uterine tumors.

Amussat¹⁰ inaugurated a practice of cutting the uterine neck to control hemorrhage due to fibroid tumors.

In 1853 Burnham,¹¹ of Lowell, Massachusetts, performed the first successful operation by laparotomy for fibroid tumor.

In 1853 W. T. Atlee¹² presented a paper before the American Medical Association entitled "The Surgical Treatment of Certain Fibrous Tumors of the Uterus, Heretofore Considered Beyond the Resources of the Art." This article won the prize of the association.

It is also claimed that Freund¹³ of Germany performed the first hysterectomy for fibroid tumor. The date, however, given for this operation is later than 1853.

In 1865 Professor Hildebrandt¹⁴ of Königsburg inaugurated the ergot treatment of fibrous tumors. This treatment was used with some degree of success and was advocated as late as 1891 by Goodell¹⁵ of the University of Pennsylvania.

In 1880 Cutter¹⁶ of Boston reported 50 cases of fibromyomata treated by electro-puncture; 32 of this number are said to have been benefited; 4 died, and 4 were believed cured.

As late as 1891, when hysterectomy was considered "an heroic measure," incision of the capsule of the fibromyomata was done by introducing a knife through the cervical canal, and then the tumor was dislocated from its bed. Bilateral oophorectomy was another operation of considerable popularity as late as 1891, because this resulted in atrophy of many of the tumors.

Hysterectomy at first was attended by an unusually high mortality, but of recent years many operators consider the mortality rate as practically nil.

Radium treatment has gained the confidence of many surgeons and radiologists because of its low mortality in carefully selected cases.

Clark¹⁷ and later Polak¹⁸ have quite definitely stated the contraindications for the use of radium.

Masson,¹⁹ W. J. Mayo,²⁰ Bonney,⁶ and Hertzler²¹ regard myomeetomy as preferable to radium in selected cases. Bonney⁶ reports having successfully removed as many as eighty myomata from one uterus. The same operator reports removing as many as seven myomata from a pregnant uterus without disturbing the pregnancy.

Tumors of the uterus have been mentioned by Hippocrates²² in his *Second Book*. Moschion²³ and Octius²⁴ have also written concerning tumors of the uterus.

Akakia,²⁵ at one time professor in the University of Paris, in his *Treatise on Female Disease*, advised that abortion be produced if the uterus contained a chronic tumor, condyloma or steatoma.

Smellie,²⁶ in 1772, mentioned glands and scirrhus tumors producing difficult parturition.

Hysterectomy for Cancer.—Cancer of the fundus uteri, except in advanced stages, has been most successfully treated by hysterectomy. Edward J. Ill²⁷ and others, have reported satisfactory results over many years. This treatment appears superior to other methods.

The treatment of carcinoma of the cervix is at present advocated by three different methods. Bonney⁶ of England and others still advise the Wertheim abdominal operation; and Bonney's statistics show a death rate for all types of cases beyond the five-year period of 15 per cent to 18 per cent. Adler⁵ of Vienna has reported a thousand operations by the vaginal route, and since employment of local anesthesia vaginal hysterectomy with radium or x-rays combined has given results hardly reached and surely not surpassed by any other treatment. The combined treatment by hysterectomies and radium showed results, after five to six years, of 58.8 per cent recoveries; without radium 42 per cent of recoveries. The patients living after three years, treated by hysterectomy and radium, were 72 per cent and without radium 60.9 per cent; and after two years there were 92.8 per cent of the patients living who had been treated by vaginal hysterectomy and radium, and 72 per cent without radium. Adler⁵ has insisted upon pushing back the ureter with sterile gauze and inserting the radium beside the gauze and adjoining the lymph node involved area of the broad ligament. Over a period of ten years he reports his relative cures of 58 per cent and absolute cures of 32 per cent. By relative cures is meant a comparison of patients cured with those operated upon, while absolute cures indicate the number of permanent five-year cures compared with the total sum whether operable or inoperable.

SUMMARY

The diversified material supplied in this group of cases for the past year from Detroit hospitals, when checked up against stated indications for treatment by hysterectomy, may invite some adverse criticisms.

In answers from a questionnaire sent to prominent gynecologists of United States and Canada one learns with some degree of surprise how great is the diversity of opinion and practice among leaders in this type of work. The question asked was "What percentage of your hysterectomies have been performed for the removal of myomata or fibromyomata of the uterus?"

The answers gave an average of 71.6 per cent of all hysterectomies having been done for the removal of fibromyomata. This compares closely with the percentage 72.15 for our group of 325.

This average of the questionnaire answers resulted from three grades of percentages, one from a group between 10 and 35 per cent, another between 65 and 75 per cent and one between 90 and 100 per cent. One operator treated all fibromyomata by myomectomy. Other operators did hysterectomies only for fibromyomata. The majority, however, did hysterectomies for fibromyomata in about 72 per cent of their cases. The remaining 28 per cent of the operations were for hemorrhages related or unrelated with recent pregnancies, for infections of the uterus and adnexa, for malignancies of fundus and cervix.

The tabulated findings of this study show in conclusion:

1. Hysterectomy is the prevailing operation of choice for fibromyomata of the uterus averaging approximately 72 per cent in this study and in the clinics of 45 of our leading operators in this country and Canada.

2. Approximately 30 per cent of uteri are removed for malignancies, inflammations, hyperplasias, and malpositions.

3. The prevailing symptoms of uterine pathology for which relief is sought are pain, tumor, and bleeding.

4. The combined use of hysterectomy and x-ray or radium is a treatment of great promise in all types of uterine pathology, especially for cancer of the cervix.

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NONMALIGNANT BREAST CONDITIONS, DIAGNOSIS AND TREATMENT

BY WILLIAM SEAMAN BAINBRIDGE, SC.D., M.D., C.M., NEW YORK, N. Y.

THE evolution of the mammary gland which dates back into the distant past was a momentous event, Wall reasons, "in that it ushered in a period when the care and education of the young by the mother became a prominent feature of life." The evolution of this gland stimulated mental development in the offspring. When an infant is able to shift for itself soon after birth, its instincts will be sufficient for its needs, and therefore its mental advancement is slow and uncertain.

The histology of the breast varies throughout life according to many conditions. Usually at the time of birth, and continuing for about five days thereafter, the infant's breast is capable of lactation. Syms describes it as "having been activated by the corpus luteum at the time the mother's breast was activated." Soon thereafter, the breast is found to be a rudimentary organ.

Throughout childhood but little alteration takes place. At the time of puberty change occurs in the breasts of both sexes, and in the female this change is progressive and lasting. The milk spaces are amplified, distention occurs at the end of the ducts, with a formation of acini, which are grouped in the formation of a lobule. This group of acini, with their ducts, is joined in the final milk canal and constitutes a glandular unit. With the occurrence of the first pregnancy, evolution takes place, and the gland becomes an active organ.

After lactation has ceased, involution sets in with a diminution of the size and number of acini and rehabilitation of fat. With each pregnancy a similar cycle occurs.

With the occurrence of the menopause comes the final involution or atrophy of all of the essential elements of the breast.

Such are the normal breast developments in the female from birth to involution. The abnormal and pathologic conditions of the human breast are many, and it is my purpose to present some of the most frequent of these nonmalignant conditions with suggestions as to their diagnosis and treatment.

Among the congenital abnormalities, perhaps the rarest is agenesis, a complete absence of both breasts, including the nipple. Cases have been reported by Mouchet, Young, and others. Polymastia, the presence of more than two mammae, is less rare as is also polythelia, the occurrence of more than one nipple on a mamma. Aberrant breast

tissue, with or without nipple formation, may be found occasionally at remote sites of the human body. Such fragments of breast tissue, anatomically shut off from the normal breast outlet, have been known to cause tumefaction at the new site.

Many theories have been advanced to account for extra breasts on the human, but Darwin's idea that polymastia is a reversionary phenomenon, based upon the theory of evolution, seems to many as good as any theory—outside of Tennessee!!

Extra mammae appear on the sculptured forms of Diana of Ephesus, and it seems an accepted fact that Anne Boleyn had three distinct breasts. If modern plastic surgery could have been applied to her chest wall, the unfortunate lady might have retained her head, thus changing the trend of English history, a fact which even Hackett seems to have overlooked in his recent brilliant biography of Henry the Eighth.

Gyneomastia (excessive growth), precocious development, or massive hypertrophy are conditions usually easily diagnosed. A luetic background or an endocrine dysfunction must be duly considered in practically all of these cases. Iodides or other antiluetic treatment, where such is required, or glandular therapy in endocrine dysfunction are the therapeutic measures indicated in the majority of these conditions.

In April, 1925, Dartigue of Paris described his brilliant technic for cases of extreme breast overdevelopment or elongation (*Arch. franco-belges de chir.*), and Noel and Lopez-Martinez (*Arch. franco-belges de chir.* 31: 138, 1929) also have an interesting technic for these cases. The latter correct extreme elongation by crescentic excisions in the skin of the breasts immediately over and partially surrounding the areola. The resulting scar blends with the areola and is quite imperceptible. If the elongation is more than 10 cm., the operation is completed by similar small crescentic excisions under the areola. These small crescentic skin excisions, made under local anesthesia, are repeated as often as is necessary for complete correction of the pendulousness. For breasts sagging more than 14 cm., the Lopez-Martinez technic of nipple transplantation is used instead of the above technic.

Dartigue's present technic for plastic restoration of the breast gives astonishingly fine results as I witnessed recently in Paris.

When we approach the benign pathologic processes of the adult human breast, our subject must be confined to very definite limits. In this discussion of the diagnosis and treatment of some of these conditions of the mammary gland (the treatment of the most frequent abnormalities of congenital, endocrine and luetic origin I have already briefly mentioned) there are two points which I particularly wish to emphasize. These are: (1) the necessity for thoughtful and exact differential diagnosis in neoplasms of the human breast (and such diag-

nosis must include the recognition and elimination of those basic factors, whether endocrine, toxic or infective and whether external or internal which might lead to progressive pathologic change in the gland); (2) the right of the patient to demand conservation of the mammary gland and preservation of the breast contour where possible.

Such points as these might seem almost too obvious to emphasize among medical men, but it is not long since an eminent surgeon said "that he would today submit every portion of a breast with a blue dome cyst to careful microscopic examination, and any breast, it made no difference what the gross appearance, where there existed one or a dozen cysts, regardless of the size of the cysts, should always be examined with the microscope."

In answer to this statement, another surgeon responded "that he did not care how the diagnosis was made, but if a whole breast must be had for examination, how could the breast be saved? This 'take out' policy would mean the mutilation of every woman with a lump in her breast."

Another authority says, "When the question arises between chronic mastitis and carcinoma, it is usually the safest procedure to remove the breast and if no malignant process is found, one has merely removed a menace to the patient."

The following statement is also quoted from the writings of a recognized authority who believes "that every benign tumor of the breast should be removed before it has an opportunity to become carcinoma-tous." In other words, it should be removed as soon as recognized.

In such instances as these—what of the patient?

Two other points which are outside the range of a paper on benign lesions of the breast but which, when discussing the breast, I feel it imperative to mention are these: (1) the searching need for the greatest care in the manipulation of the breast during examination, since metastasis may be artificially produced by massage of a malignant tumor, and this may occur as readily during the early stage in the development of the neoplasm as later; (2) the necessity for radical and adequate surgery where such measures are indicated. Faulty technique, thorough though the surgical procedure may be, is too often the cause of the dissemination of neoplastic cells.

The wide variations of even the most frequently encountered benign neoplasms of the mammary gland are among the most difficult features of differential diagnosis. These variations are emphasized recently by the extensive campaigns of cancer publicity which are bringing to physicians people with early pathologic conditions—lesions so small, in many cases, as to present few of the clinical signs of their particular tumor classification. While from the standpoint of cancer prevention, such early observation is desirable, an added responsibility in the mat-

ter of diagnosis rests upon the surgeon—a responsibility which he must be prepared by education and experience to meet adequately.

One of the main causes of abnormal change in the breast tissue is due to irritation, and when I say irritation, I mean not alone the external factors which cause inflammatory conditions but those processes which arise from endocrine dysfunction, metabolic disturbances, or toxic elements in the system altering the blood which bathes the fixed cells of the body.

Extrinsic irritation may be, of course, of traumatic or various other origins. Chronic irritation is produced either by repeated trauma to the tissues or in the form of chronic inflammatory processes. In trauma of the breast the final pathology may be but an indirect result of the original injury. Following a severe blow, there may be a tearing of the glandular tissues with resultant hematoma. This may be absorbed in part as evidenced by change of color over the area. Following the absorption of the cellular elements of the blood, the residue, serous or serofibrinous material, may become organized and form a distinct lump—a real mass of scar tissue which, surrounded by glandular cells, will cause irritation. No one can gauge the final result of a severe trauma of the breast, nor its potentialities in the development of malignancy of the mammary gland. McWilliams showed that in 100 consecutive cases of carcinoma of the breast observed at the Presbyterian Hospital, New York, 44 per cent gave a history of antecedent local trauma. W. B. Coley, in an analysis of 120 cases of carcinoma of the breast personally observed, showed a trauma percentage of 42.33.

It is generally conceded today that chronic irritation of either intrinsic or extrinsic origin, as indicated above, may be the forerunner of mammary carcinoma. Doctors Adair and Bagg have recently published a paper dealing with the relation which chronic irritation bears to the etiology of mammary carcinoma, and their data would seem to show that the relation between stasis of the female breast secretions and cancer of the mammary gland is of vital importance. The experiments were made upon a carefully inbred strain of mice with low tumor incidence. The females were divided into two groups, one serving as a control was allowed to suckle its young. The mammary ducts of the other group were ligated *on one side*. In the control group, the incidence of tumor growth was less than 5 per cent. The group in which the ducts were ligated, showed nine females (the group consisted of fourteen female mice) with mammary carcinoma on the ligated side. While it must be remembered that mice are not men, these facts call for our thoughtful consideration.

Whether chronic mastitis is of infectious origin, the result of basically toxic factors or a disturbed metabolism can scarcely be said to be clarified by the amount of literature on the subject.

The differential diagnosis between chronic mastitis, with a more or less localized lobulation and an actual, definite lesion of the mammary gland should not prove a difficult problem. In chronic mastitis, when the gland is examined between the thumb and the forefinger or the area of lobulation rolled with the flat of the hand against the chest wall, irregular, unsymmetrical masses, sometimes painful, but usually tender, are felt, as well as the more strictly localized mass which was probably the cause of the patient's visit to the surgeon.

With a diffused mastitis, elimination of pelvic or intestinal pathology in the patient may cause the inflammatory condition to recede. The most important phase of the mastitis is its etiology in relation to the development of tumors of the breast. Ewing says that "the condition begins as an inflammation and often ends as a neoplasm." He finds that a large proportion of mammary cancers occur in breasts which are the seat of chronic mastitis and agrees with Cheatle that chronic mastitis is a very important predisposing condition to mammary carcinoma. Adair and Bagg state that "we have noticed such constant association between chronic mastitis and cancer of the breast that we conclude that the malignant condition is only one step farther in the pathologic process."

For many years the present writer has been emphasizing the direct relation between chronic intestinal toxemia and a lobulation of the mammary gland. Cases have been reported again and again of "lumpy" breasts—even breasts with well-defined tumors—which have been restored to normal by the elimination of the toxic condition of the intestinal canal.

In view of the fact that there seems to be an increasing amount of evidence which points to a connection between these "lumpy" breasts (whether of toxic, inflammatory or infectious origin) and malignancy of the mammary gland, it might be well to cite one or two cases where results have proved beyond doubt the relation of the intestinal stasis to the breast pathology.

CASE 1.*—L. F., female, aged thirty-five years, married, two children.

First seen in March, 1920, for retraction of and eczematous discharge from left nipple; considerable lobulation of the upper, outer quadrant of the breasts; two small glands in left axilla.

Previously to consulting me the patient had seen two well-known surgeons, one of whom had advised radical operation, writing to the family physician, "I would urgently advise the removal of both breasts."

After careful examination of the patient, and weighing all the aspects of the case, I advised that a course of preliminary treatment, under careful observation, be given. A brassiere to relieve all pull on the upper, outer quadrant was prescribed; bicarbonate of soda baths; alkalies internally and high colonic irrigations.

Within three months the lumps in the axilla had disappeared entirely; the breasts were less lobulated; the discharge had lessened materially; the eczema about the areola had disappeared; the feel of the breast was normal, and the general condition of the patient was excellent.

*Preliminary report Medical Press and Circular, Feb. 9, 1921.

After three years there was no return of the breast pathology, and the patient is no longer under observation.

CASE 2.—A. B., female, aged twenty-five years, widow, two children. This patient had always been constipated. In March, 1915, she commenced to have pain in the right lower quadrant of the abdomen. In December, 1915, a lumpy condition of the breasts developed, with a bloody discharge from both nipples and this discharge was present when the patient consulted me in February, 1916.

There were glandular lumps in the upper outer quadrant of the breasts. Examination of the abdomen showed distinct tenderness in the right iliac fossa, along the head of the cecum and over the appendix.

X-ray diagnosis showed this to be a case of chronic intestinal stasis, for which abdominal plastic operation was performed.

Following the operative procedure on the intestinal canal, the lumps in the breast disappeared, as did also the bloody discharge from the nipple.

Today, fourteen years later, the patient is in perfect health, and the breasts are normal, although the patient had been sent to me for double breast amputation.

There is no question but that abnormal changes in the breast tissue occur as the result of intestinal toxemia in many patients. Chronic irritation from toxins in the blood constantly bathing the glandular tissue is doubtless a competent cause of inflammatory change and lobulation of the breast—a competent producing cause of mastitis. These toxic breasts, the result of poisoning from the intestinal tract, classify themselves into two groups: (1) those with generalized lobulation, frequently associated with prescribed tumors; (2) those with localized degeneration and in addition an adenoma or cystoma.

The treatment of all of these cases must be directed toward eliminating any focus of infection. Gastrointestinal fermentation should be corrected if necessary, by diet, digestives, intestinal antiseptics, often alkalies, colonic irrigations in some cases, and other therapeutic measures as indicated. Abdominal supports may be necessary in cases of relaxed abdominal walls until, by cultural care through special exercises, the tone of the abdominal muscles is restored and the enteroptotic tendency overcome. The above regime and the proper support of the breasts, in a number of instances, will cause the lobulation and associated tumefaction mentioned in group one to disappear. A few of these cases may require surgery of some part of the intestinal canal.

In cases of well-developed cystoma or adenoma, the breast tissue will demand conservative surgery. If the intestinal stasis is marked and persistent, it too may need surgical adjustment. However, I have had a number of cases in which tumors with all of the clinical symptoms of adenomas have diminished in size and finally disappeared following the plication of a mobile cecum, or the relief of intestinal folds or bands, which were causing a degree of chronic intestinal obstruction.

Pelvic infections are another source of danger to breast tissue. All of us have seen tender and lobulated breasts which became normal after the removal of badly degenerated and cystic ovaries, or after a curettage. The following is a case in point.

CASE 3.—A. S., female, aged thirty-two years, single. Two years before consulting me this patient had an operation for a uterine condition. In May, 1919, she came to me because of an irritation of the bladder, severe pain in the back and ovarian region, together with a lumpy condition of both breasts.

Curettage followed by laparotomy was performed, and a much-enlarged uterus with a considerable number of fungosities, a mass of adhesions which extended back of the uterus down to the culdesac, a fibrocystic right ovary, deep in the pelvic cavity, surrounded by a mass of omentum tightly adherent to the uterus in front and to the rectum behind, were found. The mass was about the size of two hen eggs.

The operative conditions were corrected, and by August, 1920, the lumps in both breasts had disappeared entirely. The patient is at present in excellent condition. The breasts are normal.

What proportion of these toxic breasts are precancerous remains a problem. Today we do not know whether cancer is due to a chemical reaction (in the host) which merely responds to an extrinsic irritation. In an article which was published in *Les Néoplasmes** I stated my belief that cancer is of multiplex pathology, and since that time I have had no evidence which has caused me to change my mind.

Many eminent physicians believe that "there is a constant association between chronic mastitis and cancer of the breast." Concerning the origin of chronic mastitis we are still in the twilight. Probably the elimination of pelvic, intestinal and other toxemias would greatly reduce our cases of mastitis and be a decided step forward in our cancer prevention campaigns.

Benign tumors of the human breast have been recorded throughout the course of medical history. An interesting allusion is that to a tumor in the breast of Atossa, daughter of Cyrus (B.C. 530). Atossa discovered the tumor but because of shame kept the condition a secret until it became so painful that she was forced to consult Herodotus. Unfortunately, details are lacking, which leaves the diagnosis vague, but it is evident that a periodic health examination, by competent advisers, might have saved Atossa much unnecessary suffering and later the deformity which history implies was her chief worry.

Tuberculosis of the breast, although rare, must be kept in mind, as there are more cases than usually believed. The claim is made that it constitutes about 6 per cent of all well-defined benign lesions of the mammary gland. Infections may ascend from the nipple, by way of the ducts or lymphatics, may be hematogenous, or may arise through an extension of an infective process in the ribs or pleura.

**Les Néoplasmes* 2: 5, 1923.

Dr. Nathan W. Green (in the *Medical and Surgical Report of the New York Hospital*, 1915) reports an interesting case of tuberculous mastitis in an active breast, following removal of carious teeth.

The patient was delivered of a normal child, March 3, 1914. In 1912 she came to the United States and shortly after her arrival had four teeth extracted. Two months following the removal of the teeth an abscess "behind the ear" developed, and then occurred lymphatic involvement of the neck, left axilla, area over the sternum and finally, involvement of the breast. A breast abscess broke after child-birth. This was opened and healed.

March 16, 1914, the breast was removed. After this, another lymph node became involved in the right axilla and broke down. This was opened and healed. Microscopic examination of the breast tissue showed "tuberculous mastitis in an active mamma." There was no pulmonary involvement. The relation between the removal of the teeth and the rapid involvement and extension of the infective process was very marked.

Toxemia from infected teeth or tonsils and inflammatory conditions of the mammary gland may be closely related. I have seen cases of lobulated breasts restored to normal following the removal of infected tonsils or teeth.

In tuberculosis of the breast, where chronic abscess and the formation of fistulas occur, with the enlargement of axillary lymphatics, the diagnosis is practically evident. However, where the differential diagnosis must be based upon the clinical examination of a few scattered nodules or one or more definite masses in the breast, the surgeon frequently needs all of his diagnostic acumen to decide the line of action. Tuberculosis may be associated with benign or malignant or other lesions of the breast. It is in such cases as these (where the condition may be a purely malignant one, or a malignant neoplasm associated with tuberculosis) that the greatest care must be exercised in examination of the breast so as to prevent the dissemination of neoplastic cells. Histologic, microscopic and animal inoculation may all be required to verify the diagnosis. The treatment, at the fistulous stage, may include disinfection of the sinuses with phenol, followed by alcohol, heliotherapy and rest and feeding, but when the tuberculous process is extensive, ablation of the breast tissue and inflammatory mass is the logical procedure.

The following case was sent to me as advanced sarcoma of the breast. My opinion was intended to confirm the hopelessness of any surgical procedure.

CASE 4.—M. C., female, fifty-five years of age, married. For three years the patient had had a hard nodular swelling in the left axilla with involvement of the breast. When I first saw the case, the mass was nearly the size of the entire breast and painful on pressure. The arm was painful and much enlarged. Two physicians had declared the condition to be sarcoma so advanced as to be hopeless.

After careful examination, I diagnosed the case as inflammatory, possibly

tuberculous, and decided to give her a chance by extensive operation. This was done. The pathologic report proved the condition to be tuberculosis.

The patient had an uninterrupted recovery, healing rapidly, and two years later was in perfect health. Since that time I have lost track of her.

Gummas of the breast may occur as infiltration, or as large well-defined tumors.

Bissell states that "gummata of the breasts have to be differentiated from cysts of the organ, from tuberculosis of the breast and from carcinoma." The writer believes that the chief difficulty of diagnosis is between gummata and carcinoma, since gummata frequently are painless, sharply outlined and of stony consistency. There may be no history of syphilis, or definite clinical symptoms. The Wassermann may or may not be positive.

Many diagnosticians grant the likelihood of an incorrect diagnosis in cases of syphilitic breasts and Keen's *Surgery* quotes Edward Martin to the effect that "the diagnosis from cancer may be quite impossible except from a consideration of associated symptoms and the result of therapeutic treatment." Adair states that "even those surgeons who see an extraordinarily large number of breast cases, have rarely seen a gumma of the breast." "The rarity of the condition," he continues, "is where the responsibility lies for its nonrecognition."

In the surgeon's mind, when doubt arises, a short course of anti-luetic treatment may produce rapidly curative results. A provocative Wassermann may also prove a diagnostic aid, and we are coming to realize that many patients with a late syphilitic condition have bone changes which are revealed by the x-ray, in cases where the Wassermann may or may not be positive.

In a final analysis the experienced surgeon will remember that retraction of the nipple remains an early indication of malignancy in some cases, and that in more advanced types, the lymph nodes become involved in the area of the primary lesion and not, as may be true in syphilis, at remote sites.

CASE 5.—P., female, fifty-five years of age. This patient gave a history of having been well and strong until two years before consulting me when she commenced having discomfort, more or less continuous, in the upper outer quadrant of the right breast.

Examination showed enlargement of the sternal ends of the second, third and fourth ribs on the painful side. This was verified by x-ray, according to which the pleura and lungs were not involved, and the bone changes not sufficiently characteristic to justify a diagnosis of sarcoma.

As a preliminary measure, anti-luetic treatment was instituted. The enlargements gradually disappeared. Five years later the patient's physician reported that she was perfectly well.

It is in these obscure cases that surgical judgment is more to be desired than the most perfected surgical technic.

The most prevalent benign tumors of the human breast are the fibroadenomas. Fibroma and myxoma are rare and occur usually as a differentiation of the fibroadenoma.

Fibroadenomas are mixed tumors and, according to McFarland, constitute about one fourth of the benign tumors of the female breast. They are usually slow-growing, compact and painless. They are firm and elastic to the touch and move about under the examining finger. Pure adenomas of the breast are uncommon. Karsner states that "grossly, except in density of consistency, they resemble fibroadenomas." It is in this group—the fibroadenomas—where, in a woman of cancerous age, the differential diagnosis may mean the difference between life and death for the patient. The examining fingers of the experienced surgeon often may recognize the minute but significant details which reveal the probable nature of the growth.

According to our standard textbooks, fibroadenomas which, may I remind you, constitute one fourth of all benign mammary-gland tumors, are firm, elastic, lobulated and of slow growth. They are unassociated with retracted nipples, glandular enlargements or adhesion to the skin and are rarely painful. They usually occur as single growths. In my twenty-five years of experience as a surgeon, I have found, on many occasions, fibroadenomas which varied widely from the accepted standard of requirements for tumors of this type. In spite of the classical descriptions of the fibroadenoma, I have encountered many associated with retraction (congenital) of the nipple. I have found them accompanied by glandular enlargements of inflammatory nature, of single and of multiple growth. I have examined many adenomas which have been of slow growth and which, upon frozen section, have revealed a beginning malignancy and others which have grown with great rapidity and have proved upon section to be of purely benign pathology. Some have been as small as hazelnuts; others as large as oranges. These contrasts are merely stated to indicate that we dare not make a *final* diagnosis of any breast lesion based alone upon the usual classical description of such a tumor. Clinical experience must be our guide!

The following case from my files is cited to illustrate the possibility of exact diagnosis in spite of lack of classical symptoms, and the conservation of the mammary gland in spite of apparent evidence of malignancy.

CASE 6.—V., female, fifty-four years of age, married. This patient consulted me December, 1910, for a growth about the size of a hen's egg in the outer margin of the left breast. The nipple on this side was retracted. The tumor had been observed for five years and had developed slowly, until a month earlier when it had begun to grow rapidly and had become painful.

In a woman of so-called cancerous age, the presence of a slow-growing tumor, which suddenly increases rapidly in size and is associated with retraction of the nipple, strongly suggests malignancy.

Careful inquiry revealed the retraction of the nipple to be of congenital origin; repeated palpation of the tumor mass failed to evidence the "feel" of malignancy.

Operation was performed and a V-shaped section of the outer portion of the breast, including a mass midway between the areola and the periphery, was removed. This involved about one-eighth of the breast substance. Great care was taken to maintain the continuity of the nipple and ducts with that portion of the breast tissue which was left. The posterior and anterior layers of the capsule were approximated by interrupted catgut stiches.

The pathologic report was "fibroadenoma." The contour of the breast was well preserved, and the scar became practically invisible. There was no recurrence.

In cases of suspected malignancy, wide excision of the growth, with the use of the endothermic knife or the cautery applied to the cut edges, is a safeguard to the patient. Frozen section at the time of operation may be helpful to confirm the diagnosis, but must not be accepted as an infallible guide.

In conclusion, may I again emphasize the variations which make accurate (preoperative) diagnosis, in many breast conditions, a difficult, if not an almost impossible, task? A very apt illustration of this point may be applied from a recent article by Warden Lawes of Sing Sing Prison. The warden wrote: "We approach the problem (of the criminal) with preconceived notions, and should heed the remark of the witty Frenchman who warns us to 'beware of looking for anything, for we shall be sure to find it.' The shape of the skull is frequently made the basis of criminality, and yet in examining the skull of Charlotte Corday, three distinguished authorities reached different conclusions. The personal equation of investigators enters into every investigation."

The deduction of Warden Lawes may be applied to the physical as well as the mental diagnosis. The physician who approaches a pathologic breast with the preconceived idea that a retraction of the nipple is a certain sign of malignancy may find his diagnosis far from correct. There are numerous seemingly pathologic breasts which must be considered in the light of congenital abnormalities, or as processes of evolution or involution of the mammary gland. There are chronic and acute inflammatory conditions expressed as tumefaction of the breast tissue. There are mammary glands which evidence an endocrine dysfunction in the individual, or an alimentary or other toxemia. There are carcinomatous breasts with the signs of benign pathology; there are benign tumors of the gland with many evidences of malignancy—including congenital retraction of the nipple.

Out of all of this mass of contradictory material, indicating the difficulty of exact diagnosis in breast pathology, *how* are we to arrive at a definite conclusion when called upon to diagnose abnormal conditions of the mammary gland? Epictetus said: "If you would be a reader,

read; if a writer, write" and, he might have added, if a diagnostician, diagnose. Experience is the skill or practical wisdom gained by personal knowledge, and it is such skill to which the woman with the abnormal or pathologic breast is entitled when she places her future usefulness in the hands of the surgeon. Every test applicable, clinical and laboratory, should be applied to verify the diagnosis, though it may be in order to sound a note of warning against the habit on the physician's part of shouldering his responsibility upon the laboratory. No laboratory can ever take the place of the experienced physician; his is the responsibility in the last analysis, and he should be ready to accept his responsibility to the full. Each case should have infinite patience and intelligent thought expended upon it. We should realize the individuality of each mammary gland, its past, its potentialities.

Finally, the patient has the right to demand this painstaking effort, this exactness of diagnosis. A criminal is presumed (under the law) to be innocent, until proved guilty. A mammary gland should have the same privilege. A diagnosis must be based upon every available source of relative information. When the most radical surgery is indicated, there should be no hesitation in employing it immediately; in doubtful cases there should be critical investigation and in every non-malignant tumor of the human breast the surgeon should aim toward the preservation and conservation of the mammary gland.

34 GRAMERCY PARK.

Haselhorst, G.: Actinomycosis of the Female Genitalia, Following Criminal Abortion. *Arch. f. Gynäk.* 134: 561, 1928.

The author reports a case of actinomycosis of the female genitalia with secondary involvement of the entire pelvis and the spine, following instrumental criminal abortion. The original diagnosis was puerperal parametritis. Aspiration of the pus from the posterior culdesac led to the finding of the actinomyces. The patient lived for ten months following the onset of the infection. Postmortem examination showed involvement of all the pelvic connective tissue, the tissues about the left hip joint, and several of the intervertebral discs of the spine, the sacrum, and the symphysis. No foci were found in the peritoneum or in the intestinal tract. Typical granules were found in the left parametrium, but the uterine mucosa and musculature were free. A small fistula was discovered just above the internal os leading through the uterine wall into the left parametrium. This was probably due to the original instrumentation and was unquestionably the entrance port of the infection.

RALPH A. REIS.

A RAPID NONSURGICAL PROCEDURE FOR AIDING CHILDBIRTH

BY NICHOLAS TEMESVARY, M.D., BUDAPEST, HUNGARY
(*Chief Obstetrician, Alice Weiss Maternity Hospital*)

IT HAS long been the ambition of physicians to lessen the pain of childbirth either by total obliteration, or at least by its partial relief, or by acceleration of the period of childbirth.

With regard to the first, I wish only to mention briefly the various narcotic and anesthetic methods. In the cases of ordinary labor, where the period takes hours and sometimes even days, we cannot employ chloroform or ether, because it would require too large quantities of these drugs; and, as they are not harmless, their employment would be dangerous. Therefore, in the cases of ordinary childbirth we would employ only one of these narcotics at the end of the delivery, when the presenting part proceeds through the vulva.

Considering that the pains due to the contractions of the uterus cause suffering throughout the whole period of labor, and at the time of dilatation even in a greater measure than at the expulsion period, other methods should be looked for to relieve these pains. Such is the combination of scopolamine and morphine which produces twilight sleep. This procedure, however, has already been abandoned by most clinicians, as it sometimes produced a state of excitement in the patients, which weakened the contractions of the uterus and thus protracted the labor, necessitating the frequent use of forceps. The babies were in many instances born asphyxiated or dazed. Hypnosis or other psychotherapeutic procedures (hypnionarcotics, suggestion), as they required longer preparation during pregnancy and are not indifferent to the further nerve life, failed also. Trials made with pernocton, nareylen, amnesin, somnifen, avertin and parasaeralis injections were also unsatisfactory or did not lead to any definite results. Recently the synergetic narcosis of Gwathmey has been slowly spreading through Europe.

All of these procedures, without mentioning others, have the common disadvantage that the physician has to be present during the entire labor, which is not an unimportant condition in normal, but especially so in protracted labors in private practice.

Discussing next the second method of facilitating labor, which really consists of shortening the period of childbirth, it is necessary to divide the cases into two groups: first, those in which the prolongation of the labor would prove harmful to the mother, including heart diseases, eclampsia, fever, hemorrhage, and premature rupture of membranes.

Here infection may set in more easily, etc. And in the fetus likewise there is danger of asphyxia and death. The second class includes the normal labors where the attempt is made to lessen the pains of the mother by accelerating the delivery. There is a tendency of some obstetricians to resort to cesarean section at the slightest irregularity or deviation from the normal. The statistics even of today are not nearly as favorable after cesarean section as after deliveries *per vias naturales*.

The movement for an increased number of cesarean sections was recently revived by Max Hirsch, in Germany. The propagation of this ill-advised activity, however, had not many followers and at the congress of gynecologists held a few weeks ago in Leipzig, this question was fully discussed and met with considerable opposition on all sides. There is no doubt that in many cases of prolonged labor it considerably influences the morbidity and mortality of the mother as well as of the fetus.

As far as the attempts are concerned to accelerate labor, it is primarily to be observed that they have the special aim of shortening the dilatation period, which is the most painful period of labor.

The acceleration of the dilatation of the cervix and the os uteri can be attained mechanically by the Bossi and Tarnier dilators. However, if force is used in employing these instruments or the dilatation is performed too rapidly, great damage is done by laceration of the cervix and consequent profuse bleeding. These instruments have been removed from the instrument case of most obstetricians. The met-reurynters, which are introduced into the uterine cavity, as the Voorhees, Barnes or Braun bags, can only be employed in very special cases, because of the danger of introduction of pathogenic germs.

It is indubitable that at present drugs increasing the contractions enjoy the widest popularity. First of all, we have to mention quinine, which can be given with success, but in small doses it very often remains ineffective, and when given in large doses it may cause disagreeable symptoms.

We may say that the greatest progress in this way has been made through the discovery by Hofbauer of pituitary extract and its effect on the muscles of the uterus. It was found, however, that one has to be very cautious and that the drug can be given only during the expulsion period or at the utmost with a disappearing os uteri, as it often causes tetanic contractions of the uterus, which may be harmful to the mother and the fetus during the dilatation period. Lately, some have tried to give $\frac{1}{2}$ part of the pituitrin dose, and this small dose was repeated 4 or 5 times at half-hour intervals. This method, which was first recommended by Stein, of New York, has the disadvantage that it is very often ineffective and the continuous presence of the physician is required. Very often the first or second dose is effective, while the third or fourth doses are ineffective.

We would call a medicament ideal which would increase numerically the ordinary contractions as well as their intensity. The pains should, however, remain physiologic and rhythmical, and the muscles of the uterus should not become exhausted in spite of the increased work, until the termination of labor. Its effect should extend to the placental stage, and the secondary atony of the uterus after childbirth should not take place, as occurs with pituitrin.

About four years ago in Vienna I reported my experiments at the Congress held by the German Gynecologic Association. Experiments with nearly all the glands of internal secretion were tried on pregnant animals and with surviving organs, according to the well-known Magnus-Kehrer method. From these experiments I found that the thymus extract is most suitable for our purposes. Its effect, it seems, is not a specific one of the thymus gland, and as far as its intensity is concerned, is inferior to pituitrin extract. The latter has a short effect only and, as already mentioned, frequently produces tetanic contractions. On the contrary, the contractions produced by the thymus extract, although not so intense, are more rhythmical and last longer.

From Ascher's Physiological Institute in Berne, important articles have appeared by Mueller and Del Campo. Their results were recently confirmed by Held; namely, that thymus extract possesses another quality, very important for our purposes, a specific by which the time of exhaustion of the not over-fatigued muscle can be delayed, thus acting as a preventative. These observations led me to the conclusion that both glands, the pituitary and the thymus gland, could be employed to cause strong uterine contractions whose effect would last longer.

After prolonged experiment, I succeeded in combining satisfactorily the extracts of the two glands. These experiments have since been confirmed by Graff with the Molidor and Pick procedure, which consists of diuresis experiments in dogs.

I afterwards employed this drug with good results in human labor. At the beginning I was able to report very good success in 150 cases which was followed by another series of new successes. These induced the Chemosan factory in Vienna to put a standardized preparation before the profession, bearing the name of "Thymophysin."

Further observations with this preparation have since grown to more than 1000 cases. My personal observations were made at the All Saints Hospital at Breslau, during the period when I was assistant, and recently at the Budapest Lying-in Hospital as chief of service. Among other clinicians reporting favorably upon the use of this drug are the following: Burghardt of Wurzburg, Jahreiss of Augsburg, Graff, Adler, Keitler, and Aschner of Vienna, Caspary of Dresden, Ostreil of Prague, E. Zweifel of Munich, Haynes of Detroit, and Jarcho of New York.

The effects of thymophysin may be summarized as follows: The drug can be employed where there is no great disproportion between the pelvis and the head and where diseases of the kidneys or heart are not present. The time of employment is chiefly in the dilatation period. During the expulsion period we see results similar to those with pure pituitrin preparations. Some workers, as Lieb, Jareho, and others, have seen better results in the expulsion period with thymophysin than with pituitrin alone. During the third stage of labor, a large dose of pituitrin gives a better result. The employment of the drug too early in labor, that is, when labor has not yet begun, is not desirable, though no harmful effects even in this stage have been observed. The normal dose of thymophysin appears to have no effect whatever if the uterus is not yet sensitized or the labor has not begun. Thymophysin is also employed for diagnostic purposes to distinguish the so-called false pains from the ordinary pains of childbirth. If a woman is given 1 e.e. of thymophysin and it has no effect, then one can be almost sure that labor has not yet begun, and the patient is not compelled to stay in the hospital for days, though she has false pains. As already mentioned, thymophysin is effective at the beginning of the dilatation period, and we may say that at this period the effect is the best. This effect is the most important one, because as labor progresses the pains become less intense. On the other hand, if thymophysin is given at once, the contractions will appear every two or three minutes, and their intensity will be much greater.

The peculiarities of the effect of the thymus extracts make it desirable that this drug should not be given if the uterus is exhausted, as it will be quite ineffective. In this case if the woman has been in labor for many hours and labor does not progress, the best course would be to rest the uterus with morphine, and only if this is done, may thymophysin be administered.

In normal cases labor usually lasts on the average from sixteen to twenty hours in primiparas, and from ten to twelve hours in multiparas; but sometimes it is extended over a much longer period, even days. However, by employing thymophysin the primiparous labor lasts from three to five hours and the multiparous labor from two to three hours instead of the normal time already mentioned.

Graff, of the Kermauner Clinic, treated 270 patients with thymophysin and found that three hours is the regular time in which birth occurred, and as stated by himself, in many cases the birth occurs in a surprisingly short time. Among the 270 cases there were only 5 in which the labor lasted five hours.

Oliver, of the Vienna Lucina, treated 100 patients with thymophysin; and, according to his experience in the case of primiparas, the average time was three and a half hours and the average time for multiparas was from twenty minutes to two hours.

Gräfenberg, of Berlin, found the whole time of labor in primiparas to be four hours, and in the case of multiparas, only half of this time.

Haynes, of Detroit, who became acquainted with this drug in Europe, reported in the *Michigan State Medical Journal* that in 31 cases the time in which birth occurred was from twenty to one hundred eighty minutes after employing the drug. These numbers prove that the employment of thymophysin, at the right time, considerably shortens the labor.

The employment of thymophysin is not only indicated in those cases where we desire to lessen the pains of the mother in normal cases, but also in pathologic cases when a quick birth is desirable in the interest of the mother and child, or with strong pains only, delivery by the natural passage is impossible. In such cases if, according to Bumm, pituitrin can be called "medicamental forceps," we can certainly call thymophysin a "medicamental dilator." Such indications are premature rupture of membranes, or artificial rupture of the membranes for some cause such as placenta previa, slightly contracted pelvis, elderly primipara, and eclampsia in not too serious cases. We know very well that a premature rupture of the membranes and the consequent protracted labor can have dangerous consequences. On the one hand there is greater possibility of the infection of the mother and this is where the morbidity and mortality of the mother occur; and there is also asphyxiation of the fetus, and intrauterine death following premature rupture of membranes is liable to occur much more frequently. It is, therefore, to be recommended in cases of rupture of the membranes to endeavor to shorten the delivery.

It is further well known that in a slightly contracted pelvis the adjustment of the head depends on the intensity of the pains. Therefore, in these cases there are also indications for employing thymophysin.

With placenta previa I have seen very satisfactory results in 10 cases, naturally only with the marginal type when, after rupturing the membranes, thymophysin was given. In such cases the part lying in front tampons the placenta previa, and the strong labor rapidly enlarges the cervical canal. As far as the mild cases of eclampsia are concerned, it is easily understood that a rapid labor may be life saving. In these cases, even in a preeclampsia stage, pituitrin is contraindicated, because it causes an increase of blood pressure. On the other hand, many physicians have made the observation that after the use of thymus extract the blood pressure decreased. My observations have confirmed the observation that, if we combine the two above mentioned preparations, they neutralize one another and can, therefore, be given in eclampsia cases without hesitation.

Thymophysin is sometimes ineffective. The reasons for this, after disregarding cases where the preparation is incorrectly given, or in too small a dose, or too late, are the following: when labor has not yet begun, when the uterus is too exhausted or too distended (twins or hydramnios), or in consequence of toxic injury to the muscles of the

uterus, or perhaps also in injury to the nervous centers through the infection which at the time is not yet manifest.

The dosage: One cubic centimeter has been found a sufficient initial dose. Only in cases of need, when the effect is not sufficient, or if it ceases before labor is over, a second, or in exceptional cases, a third injection may be given without any harmful effect. The injections must be given intramuscularly, best intragluteal, but never intravenously. The first pains are very strong and so intense, as stated by many physicians, that only those who know the thymophysin dosage do not fear them. In many thousands of cases there has never been observed any harmful effect attributable to thymophysin upon the mother or the child. Thymophysin produces no secondary inertia and the effect lasts over the placental period so that the placenta is generally expelled spontaneously a few minutes after birth without much bleeding.

My experience and that of others in a large series of cases will vouch for the efficiency of thymophysin, both in the cases of normal and of pathologic labors. Since labor is shortened, pain is lessened, and the child is protected from such injuries as may result from a protracted labor. Fatiguing work is made lighter, much time is saved, and the attendant's work is made more agreeable. With this method it is also possible, because the time of the labor is considerably shortened, to employ a harmless, pain-diminishing drug.

Zacherl, H.: *Appendicitis in Its Relation to the Female Sex Organs.* Wien. klin. Wehnschr. 42: 11, 1929.

Little that is new is offered, and the treatment advocated is along orthodox lines. In pregnancy with appendiceal abscess the author does not favor induction by vaginal section plus drainage by laparotomy, as some writers have suggested, but leans toward laparotomy for the appendiceal abscess alone. He emphasizes early diagnosis and operation when the condition complicates pregnancy.

FRANK SPIELMAN.

Devraigne, L., and Mayer M.: *Treatment of Grave Hemorrhages by Means of Intravenous Injections of Citrated Serum.* Bull. Soc. d'obst. et de Gyneec. 7: 466, 1929.

The authors report 4 cases of severe hemorrhage successfully treated by means of intravenous injection of citrated serum. The beneficial action is due to effects similar to those of normal saline solution and blood transfusion, as was proved in animals. The solution used by the authors contains the citrate of sodium, calcium, magnesium, ammonia, and manganese in addition to distilled water.

J. P. GREENHILL.

POSTOPERATIVE ABDOMINAL AUSCULTATION

BY JAMES E. KING, M.D., BUFFALO, N. Y.

IN 1819 Laënnec published his work on auscultation for the diagnosis of pulmonary disease, and since that time the stethoscope has become indispensable to every practicing physician. Its value and use have broadened, and today we find it an aid to the diagnosis of many other conditions besides that for which it was first proposed. Its use in abdominal diagnosis, however, has found small place in medicine and still less in surgery. The chief reason for this lies in the fact that peristaltic sounds, even under normal conditions, vary greatly with the intake of food and the stage of digestion. It is therefore impossible to define exactly the sounds associated with normal intestinal movement. It is also impossible to determine by its character the particular point of origin of the peristaltic contraction, although one may differentiate between small intestine and colon. In the light of our present knowledge abdominal auscultation can distinguish only two conditions, the absence of peristalsis, or its abnormal activity.

The x-ray plate, the fluoroscope, and the moving picture have destroyed many cherished views regarding intestinal activity. They have shown that an enema administered through the colon tube is no different in effect than an enema through the rectal tip. They have taught us much else of value concerning the behavior of the digestive tract in health and disease. Perhaps in the future some patient worker may be able to correlate those known intestinal movements with the sounds produced. There are also great possibilities for the painstaking clinician who will study intestinal sounds in connection with the clinical manifestations of abdominal disease. For the present, however, the value of abdominal auscultation is confined almost entirely to the province of the abdominal surgeon.

A large number of abdominal operations are associated with some postoperative disturbance of intestinal peristalsis, either as a result of perverted nerve impulses or as a direct effect of a complication. To him who becomes familiar with the postoperative behavior of the intestines as revealed by auscultation, the stethoscope will contribute much to a better understanding of these clinical conditions, and it will sometimes render valuable aid in the early diagnosis of certain postoperative complications.

The most common intestinal disturbance following laparotomy is the so-called "gas pains." Under this term the surgeon is content to classify most of the postoperative abdominal pain and discomfort. There has been much written in explanation of this troublesome con-

dition. Two outstanding clinical features are that it appears from twenty-four to seventy-two hours after operation, and that the type of operative procedure seems to have little to do with its occurrence or severity. A comparatively simple operation for retroversion may be followed by marked intestinal disturbance, while one involving separation of extensive intestinal adhesions may pursue a placid postoperative course. It is not within the province of this paper to discuss at length the causes; suffice it to say that in the large majority of instances "gas pains" may be regarded as a disturbance of normal motility of the intestine arising from a perversion of the innervation. The clinical types that are encountered are difficult to classify, for they present varying degrees of distention and pain, sometimes associated with equally varying degrees of nausea and vomiting; and the many possible combinations offer great variation in the clinical picture. If, however, one will approach such postoperative manifestations as being possibly due to disturbed intestinal innervation, the stethoscope will afford a basis for classifying these cases within certain limits.

The postoperative disturbed nerve impulses may be regarded as producing in the intestinal tract three results: inhibition, overstimulation, and reverse peristalsis. The question as to whether these states are produced reflexly, as a result of the abdominal incision, or whether they follow manipulation of the intestines and originate in the sympathetic system will not be discussed here. It may also be urged that the anodyne required after most abdominal operations is a large factor in producing the intestinal disturbance. That it has some influence may be granted, although in patients where anodynes have not been given gas pains sometimes occur. In a practical clinical approach to the subject, however, it makes little difference whether anodynes are or are not a factor, as relief of pain caused by the operation itself must be afforded.

The course of events in the majority of laparotomies is as follows: For a variable period auscultation shows a much diminished peristalsis. Peristalsis increases during the next twenty-four to forty-eight hours, and the pain associated with it bears a relation to the severity of the contractions. A cathartic and enema at this stage result in expulsion of gas and a bowel movement, following which normal peristaltic action is apparently reestablished. The first stage may be regarded as the stage of inhibition, the second as one of spastic contraction. The difference in intensity and duration of these two stages, often with the addition of distention and vomiting, gives the variation in the clinical picture. With distention that appears early after operation, there is practically always associated a marked decrease in peristalsis. An occasional gentle peristaltic wave is heard, but colon peristalsis is absent and no flatus is passed. If an enema be

given during this stage of inhibition, it is not successful and usually has to be syphoned back. As soon as colon gurgling appears, however, an enema may be given with confidence that it will be successful. Until this occurs efforts to relieve the distention will be of little avail. If, in such a case, vomiting adds to the discomfort of the patient, it will be found as a rule to be the result of duodenal regurgitation, as evidenced by the character of the material vomited. I have never been able to distinguish any characteristic sounds associated with this type of vomiting. Whether it is due to a true reverse peristalsis or merely to a seeping back of duodenal contents through a relaxed pylorus, is difficult to decide. The use of the stethoscope in such postoperative states of course is not essential to the safety of the patient, but it does give to the surgeon a certain confidence and satisfaction in the thought that he has some knowledge of what is transpiring in the abdomen and suggests a rational plan of treatment. The degree of inhibition varies up to the point of what might be regarded as true paresis, a condition which will be discussed later.

The spastic stage following the stage of inhibition produces the pain we designate as "gas pains." The term is appealing, although not entirely accurate, as frequently severe pain of this stage is not associated with distention. On the other hand, however, the degree of distention often bears a relation to the severity of the pain. The stethoscope during this stage shows marked peristalsis of the sudden forceful type. There may be continuous pain with exacerbations cramp-like in character, coinciding with the peristaltic sounds. They may be heard all over the abdomen, although occasionally they seem to be confined to certain areas. In some instances it has seemed that the cause of these forceful contractions was due to the fact that stimulation returned first to certain segments only, and that a part of the tube was still under the influence of inhibition. Another occasional manifestation of this stage is a constant pain in the midline above the umbilicus, referred through to the back. It comes on rather suddenly and may last for several hours. The patients describe it as a continuous griping cramp, and auscultation does not show the usual forceful peristalsis. Possibly here we have a spasmodic contraction of the duodenum.

We may now pass to a consideration of the more serious postoperative abdominal complications. The most important and frequent are peritonitis and obstruction, and for a third may be added intestinal paresis, or paralytic ileus, known to the laity as "paralysis of the bowels." In a consideration of these conditions in connection with the value of auscultation, no attempt is made to discuss the well-known clinical aspects. It is obvious, however, that the stethoscope is of value only when the auscultatory findings are appraised in their relation to the clinical evidence.

The classification of peritonitis by the older surgeons into plastic and septic is not a strictly accurate one, for the plastic peritonitis is associated with sepsis, and the septic is associated with plastic adhesions. As a clinical grouping it is convenient, as it implies in the one the action of the less virulent bacteria, such as the colon bacillus, and in the other invasion by the more virulent streptococcus. Perhaps the most typical illustration of the use of the stethoscope in peritonitis is found in the ruptured appendiceal abscess. Naturally, the diagnosis of ruptured abscess is almost never in doubt, as the physical findings and clinical evidence are sufficient for the surgeon of experience. It is interesting to observe, however, how promptly the inhibition of peristalsis appears. Almost directly there is a marked decrease in intestinal movements. There may be heard at intervals a gentle, quickly subsiding movement, as though an isolated intestinal coil were making a feeble attempt to resist the inhibition placed upon it. Usually, however, by the time the patient is seen by the surgeon, peristalsis has ceased. Following the operation the distention increases and no peristaltic sounds are heard, and the silence may be disturbed only by the boom of the heart clearly transmitted. Our house surgeons like to characterize this as the "graveyard belly," a term which unfortunately may have a double significance. This state of affairs persists for three days, four days, or perhaps a week, and then one day a gentle sound is heard and after an interval another, which relieves uncertainty. It is a welcome sound. At this stage the opium is decreased, for it is assumed that the Alonzo Clark treatment has been employed. During the next twenty-four hours peristalsis has become more general, a small enema may bring gas, and the patient may be considered then as entering the stage of convalescence. The inexperienced surgeon has great difficulty in leaving these patients alone. If vomiting is a marked feature, and the distention is great, instead of employing the stomach tube and opium, he adds distress and increased danger to the patient by the use of cathartics and various enemas. He may seek to relieve the distention by pituitrin or may even consider intestinal drainage. Every surgeon of experience has been asked to see such cases, and to pass upon the advisability of drainage on the assumption of obstructed bowel. The stethoscope under these circumstances is a great comfort, and makes it possible to take a firm stand on diagnosis and treatment, and helps in determining the prognosis.

A plastic peritonitis that follows an operative procedure is first indicated also by the absence of peristalsis. In cases where from the nature of the operation peritonitis may be anticipated, it is found that peristalsis disappears in from twelve to twenty-four hours. After this, the course is similar to that as outlined above.

The septic form of peritonitis will give early the same evidence on

auscultation as the plastic type. Naturally, one will not be able, by the stethoscope, to differentiate between the plastic and septic forms. I have sometimes noted early in the septic form a continuous, gentle peristalsis heard all over the abdomen as though the entire intestine were in a state of gentle purposeless movement. This, however, is transient and is followed by a complete absence of peristalsis. The greater virulence of the septic peritonitis is indicated by the clinical picture and death occurs without peristalsis being reestablished. In these cases the stethoscope offers nothing of value except its aid in early diagnosis.

Postoperative obstruction of the bowel is dreaded by every surgeon. Its early recognition is essential for successful treatment. The diagnostic criteria furnished by the average textbook are often those of an advanced stage. Vomiting and cramp-like pain are the two clinical indications of the greatest importance. Postoperative vomiting that persists after twenty-four hours, or vomiting that begins two or three days after operation, calls for careful analysis in its relation to the general clinical picture, together with the evidence obtained by abdominal auscultation.

Obstruction following pelvic surgery, in the majority of instances, has its origin in the small bowel, the last two feet of the ileum being the most frequent location. By far the greatest number of these obstructions will be found as angulations due to an intestinal loop becoming adherent to a denuded surface or line of suture. Such a case should present little difficulty in early diagnosis. Vomiting begins promptly if the obstruction has occurred directly after operation, but during the period of usual postoperative peristaltic inhibition it may be infrequent. At the end of forty-eight hours vomiting increases in frequency, and is accompanied by peristaltic pain. Auscultation at this time gives evidence of forceful intestinal contraction, distention progresses, and the vomited material consists of duodenal contents. The question now is, whether one is dealing with an obstruction, or an aggravated case of spastic peristalsis. The stethoscope demonstrates active peristalsis, and one is justified in expecting, if the case is not one of obstruction, that an enema will bring gas. If repeated effort in this direction fails and if at the same time there is increasingly violent peristalsis, a diagnosis of obstruction is justified. In my own series of cases this diagnostic criterion has been most reliable, and I have come to depend more and more upon auscultation in establishing an early diagnosis. One must remember, however, that with the higher obstructions the first enema or two may bring away some flatus that lies below the obstruction. This should not be misleading, for if auscultation shows violent peristalsis we have reason to expect very soon a corresponding satisfactory response from the colon. There is a great difference in the interval between the painful peristaltic con-

tractions. Early they may be rather infrequent, increasing in frequency as the condition progresses. Later, when distention is marked, there comes a time when the edematous bowel can no longer contract so completely; and one hears the tinkle and gurgle of shifting fluid and gas in the distended bowel. As the end draws near, the migration of bacteria and absorption of toxins may abolish peristalsis and the patient dies, the picture of peritonitis.

In the less common types of obstruction, auscultation is also of great advantage. One sees occasionally instances in which the bowel is obstructed perhaps in two places with several feet between the two points of obstruction. Or it may happen that following operation a considerable portion of collapsed bowel has prolapsed into the pelvis and become adherent. In these circumstances there may be very moderate distention, and peristalsis becomes more or less localized. This has been noted a number of times.

Perhaps one of the greatest values of the stethoscope is in the early differentiation between obstruction and peritonitis. I have never known it to lead one astray if the evidence obtained by auscultation has been carefully considered in connection with the clinical evidence.

Whether or not the so-called postoperative paralytic ileus should occupy a place as a surgical complication is difficult to decide. The possibility of its occurrence, theoretically at least, cannot be denied, as a somewhat comparable condition is seen in acute dilatation of the stomach. It must be extremely rare, although one hears not infrequently of a postoperative death due to this cause. A death from "paralysis of the bowels," however, is attended by far less embarrassment to the surgeon than a death from peritonitis. It is a diagnosis that apparently has been handed down from the early days of abdominal surgery when peritonitis was far more common and far less understood. If such a condition does exist, certain it is that there is no well-defined clinical data that establishes a diagnosis. Whether auscultation offers any aid is a question that cannot be answered. Extreme postoperative inhibition continuing for several days with great distention, vomiting, absence of peristalsis, where cathartics and enemas are futile, presents a clinical picture that suggests the propriety of regarding it as a paralytic condition of the bowel. If one wishes to regard it as such, there can be no quarrel. If, however, one has studied by auscultation a series of patients showing operative intestinal disturbance, he is convinced that in these extreme instances he is not dealing with a difference in kind but one of degree.

Like all specialized procedures in diagnosis, abdominal auscultation requires study and personal observation. The results are obviously not as definite and convincing as those obtained in pulmonary and cardiac disease. No attempt here has been made to describe the sounds

produced by peristalsis. They are too varied. A large number of patients following operation will show no deviation from normal. In the study, however, of patients showing disturbance the stethoscope will reveal much of interest and value. I believe that we should eliminate the term "gas pains" from our discussions and leave it, together with "paralysis of the bowels," to those members of the laity who find it desirable to embellish the recital of their surgical experience.

1255 DELAWARE AVENUE.

SARCOMA OF THE VAGINA

BY STEPHEN E. TRACY, M.D., F.A.C.S., PHILADELPHIA, PA.

SARCOMA of the vagina is fortunately a rare disease. In 1911 McFarland could collect from the literature only 101 cases which, with the one he added, made a total of 102 cases up to that date. He stated that there were only 68 cases of sarcoma of the vagina (not including sarcoma botryoides) reported in forty-two years. In his collection he found only one case which was congenital and one case which came to operation when the patient was eighty-two years of age.

Williams tabulated a consecutive series of 9,226 tumors found in women. Of these 2,648 were of uterine origin, and only 54 tumors arose from the vagina. Of the 54 vaginal neoplasms only two were sarcomas.

Lynch reported that there had been only one case of sarcoma botryoides in his clinic at the University of California among the last 4,000 gynecologic cases.

A large percentage of sarcoma of the vagina is found in childhood as sarcoma botryoides, the first case of which seems to have been reported by Gersant in 1854.

It is claimed that sarcoma of the vagina in children develops from misplaced embryonal mesodermic cells and that it is a mixed tumor; while in adults the lesion results from metaplasia of connective tissue cells. For these reasons and because of the different clinical picture, sarcoma of the vagina is classified as that which is found in children, and that which develops in adults.

In sarcoma of childhood it is possible that the growth may be present at birth but is overlooked. It is usually stated that the majority of lesions develop during the first year. McFarland's statistics disprove this idea. In a careful review of the literature he tabulated 44 cases of sarcoma of the vagina; 34 of which were sarcoma botryoides present in children within the first five years of age, and ten of which were

sarcomas of miscellaneous types found in children between the ages of eight months and thirty-one months.

The age incidence in sarcoma of the vagina in children was as follows:

	BOTRYOIDES	MISCELLANEOUS	TOTAL	PERCENTAGE
1st year	9	3	12	27.2
2nd year	8	6	14	31.8
3rd year	11	1	12	27.2
4th year	4	0	4	9.1
5th year	2	0	2	4.5
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	34	10	44	99.8

These figures show that only 27.2 per cent of the cases developed during the first year of life. The greatest percentage 31.8 developed during the second year of life. During the first three years of life there was found 86.2 per cent of the cases.

The location of the 34 cases of sarcoma botryoides as tabulated by McFarland was as follows:

Anterior vaginal wall	10
Posterior vaginal wall	4
Left vaginal wall	4
Right vaginal wall	2
Vulvovaginal entrance	2
Whole vaginal	2
Not stated	10
	<hr/>
	34

In the series of cases of sarcoma of the vagina in children collected by McFarland, all types of histologic pictures were presented.

The first symptom of vaginal sarcoma in children is usually a bloody discharge. Occasionally a polypus protruding from the vulva first calls attention to the lesion. Pain follows rapidly. As the growth fills the pelvis, there is pressure on the bladder, and later cystitis develops, while pressure on the rectum may interfere with defecation.

A review of the literature makes it evident that surgery is of no benefit. After removal the tumor recurs rapidly; the pelvis becomes filled with the growth, and the patient dies from exhaustion or toxemia.

Sarcoma of the vagina in adults like that in children is also rare. McFarland could collect only 58 cases. Vaginal sarcoma in the adult is of two types—the mucosal and the parietal.

The mucosal type presents itself as a mass of soft growth projecting from the infiltrated mucosa, or as a circumscribed tumor.

The parietal variety is more common and usually develops as a well-defined tumor only slightly movable. Occasionally this type develops as a dense nodular infiltration.

McFarland's table of the age incidence of sarcoma of the vagina including 10 cases of miscellaneous sarcoma of the vagina in infancy, but not sarcoma botryoides, was as follows:

	MISCELLANEOUS
First decade	10
Second decade	9
Third decade	5
Fourth decade	16
Fifth decade	5
Sixth decade	9
Seventh decade	1
Eighth decade	1
Ninth decade	1
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	57
“Young woman”	1
“Old maid”	1
Age not given	9
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	68
Botryoides	34
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Total cases	102

These figures show that the tumors are found most frequently in the first, second, fourth and sixth decades of life, with the largest percentage in the fourth decade. The tumor may develop in any part of the vagina but is usually located in the lower portion of the canal.

The location as shown by McFarland's table, including 10 cases of miscellaneous types in children, was as follows:

Vulvovaginal entrance	2
Entire circumference of vagina	2
Anterior wall	20
Posterior wall	19
Right wall	12
Left wall	4
Vesicovaginal septum	1
Rectovaginal septum	1
Not stated	17
	<hr/>
	78

We have had under observation four additional cases of sarcoma of the vagina. Two were in the right side of the vagina, one on the anterior wall and one on the right side of the vulvovaginal region. Of these four tumors, two were round cell, one was a spindle cell, and the fourth was of the mixed cell type.

The first case was that of Mrs. E. E., age fifty-five years mother of seven children, who came under observation September 5, 1910. She had had a tumor removed from the vagina more than a year before. At the time of examination she had a mass filling the right side of the vagina and pelvis. On September 12, 1910, the tumor was removed and was found to be a round cell sarcoma. The patient died May 10, 1911, having survived two and one-half years after the tumor was first discovered.

The second case, Miss A. B., age thirty-two years, came under observation in 1911. She had a mass 3 cm. in diameter located in the vesicovaginal septum. The tumor was removed and was found to be a round cell sarcoma. The result in this case is unknown, as the patient disappeared from our observation two and one-half months after leaving the hospital. It is reasonable to suppose that she developed a recurrence, with early death.

The third case is that of Miss S. B., age thirty-five years, a stenographer, who came under observation September 20, 1922. Menstruation began at thirteen years of age, was of the twenty-eight day type, and of seven days' duration. Periods were regular until two years before, when she had amenorrhoea for three months. The last month she menstruated twice, periods of five and six days respectively. Menstruation had always been accompanied by severe headaches and were preceded by pain which became less as the period developed. There had also been considerable leucorrhoea the last four years.

The last year she suffered with pain in the pelvis and lower abdomen, especially on the left side. At times there had been a burning pain about the rectum, backache and pain in the right leg. The bowels were constipated, and micturition was frequent. The symptoms became gradually more marked, and in April it was necessary for her to resign from her position.

Examination of the abdomen was negative. Pelvic examination revealed a mass in the right side of the vagina. The tumor was semisolid, slightly movable and extended from 2 cm. within the vulva to nearly the vault of the vagina, filled the space between the rectum and side of the pelvis, and pushed up the posterior vaginal wall. The cervix, uterus and appendages were normal. A provisional diagnosis was made of sarcoma, and the removal of the tumor was recommended.

Patient was admitted to the Stetson Hospital on September 23, 1922. Examination of the blood was as follows:

Hemoglobin 85 per cent, erythrocytes 4,480,000, leucocytes 9,100. Polymorphonuclear leucocytes 74 per cent, small lymphocytes 18 per cent, large lymphocytes 8 per cent.

Phenolsulphonephthalein output for two hours was 42 per cent. The urine was negative with the exception of a few epithelial cells.

On September 25, under gas anesthesia, the perineum was divided, and the mass was enucleated. Bleeding was profuse and could be controlled only by packing the tumor cavity with gauze. The perineum was then sutured and the vagina packed tightly with gauze. The following day the vaginal gauze was removed, and all the gauze from the tumor cavity was out by September 30. The wound was healed and the patient was discharged from the hospital October 13, 1922.

The pathologist reported the tumor to be a degenerated fibroma with several fair-sized cysts throughout the specimen. A number of other pathologists agreed with the histologic report.

The patient was seen again on December 18, 1922, at which time she looked well and stated she was much improved and had resumed her occupation. Examination showed the pelvic organs to be normal with the exception of some thickening of the vaginal wall in the region of the wound.

She reported again on June 6, 1923; at which time she complained of headache, pain in the pelvis, lower abdomen and right leg. Pelvic examination revealed a growth in the right side of the vagina about 50 per cent larger than the original tumor. A clinical diagnosis was again made of sarcoma, and operation was recommended.

The patient was admitted to the hospital on June 23, 1923. Examination showed the blood, urine and renal function to be normal. The Wassermann test was negative.

On June 25, under gas anesthesia, the perineum was divided in the middle line, and the tumor was enucleated. The hemorrhage was again profuse, and could be controlled only by packing the cavity with gauze which was brought out at the lower end of the incision. The split perineum was sutured, and the vagina packed tightly with gauze. The gauze packing was removed gradually and was all out at the end of the fourth day.

The pathologist now reported the specimen to be a spindle cell sarcoma. The slides were examined by several pathologists, who concurred in the diagnosis.

On July 16, blood examination showed the hemoglobin to be 58 per cent, erythrocytes 3,020,000, leucocytes 7,100. Polymorphonuclear leucocytes 72 per cent, small lymphocytes 19 per cent, large lymphocytes 8 per cent, eosinophiles 1 per cent. On this date under nitrous oxide oxygen anesthesia, the center of the incision over the tumor cavity was opened, and 100 mg. of radium were implanted deep into the cavity and allowed to remain twenty-four hours.

The patient vomited several times while the radium was in place, and complained of pain in the pelvis and of a burning sensation in the bladder.

On July 18, the blood showed the hemoglobin 54 per cent, erythrocytes 3,000,000, leucocytes 10,200, polymorphonuclears 82 per cent, small lymphocytes 14 per cent, large lymphocytes 3 per cent, eosinophiles 1 per cent.

The nausea persisted for three days. The temperature on July 17 at 6 P.M. was 102 degrees F. Two days after the application of radium the patient developed a mild bilateral parotitis, which cleared up in a few days. The discomfort in the bladder continued, and a week later there was considerable pain in the rectum during evacuation.

On July 20, blood examination was as follows: hemoglobin 50 per cent, erythrocytes 2,840,000, leucocytes 6,000, polymorphonuclears 72 per cent, small lymphocytes 19 per cent, large lymphocytes 8 per cent, eosinophiles 1 per cent.

The patient left the hospital on July 29, weak and anemic. She had considerable pain in the pelvis and was compelled to remain in bed for nine months.

When seen at her home on September 24, 1923, she complained of severe pain in the right side of the pelvis and of marked discomfort in the bladder. Examination showed distinct infiltration in the right side of the vagina.

Two months after leaving the hospital she developed a rectovaginal fistula, with pain in the pelvis so severe that it was relieved only by opiates. The pain in the pelvis and the distress in the bladder continued, and she was given morphine freely all winter. The rectovaginal fistula persisted for six months. After it closed, the suffering became less, and the narcotics were gradually withdrawn. In the spring the patient was able to be out of bed, improved rapidly and gained seventy pounds in weight. When seen in May, 1924, she was much improved but complained of marked discomfort in the pelvis, burning and frequent micturition, and severe pain on defecation.

She was admitted to the hospital on June 4, 1924, and under gas anesthesia a vaginal examination showed decidedly less induration in the tissues on the right side of the pelvis. Rectal examination showed the lumen of the bowel to be somewhat constricted from the scar tissue. As a result of the examination the fistula opened and discharged for two months.

Eighteen months after the application of radium, menstruation reappeared and lasted for five days. Since then she has menstruated a few times irregularly, the last period being in September, 1927.

In September, 1925, she came to the hospital complaining of a discomfort in the right side of the pelvis. Examination showed scar tissue at the site of the former tumor. There was no evidence of any recurrence of the sarcoma. Mild x-ray treatments were given with the hope that the discomfort in the pelvis would be relieved.

Because the x-ray treatments appeared to give relief, she received nine during the year and has since been more comfortable.

When seen on September 5, 1929, over six years after the second operation and the application of radium, and seven years after she had come under observation, there was no evidence of recurrence. The patient was fat and the picture of health but had considerable discomfort in the right side of the pelvis.

The fourth patient, Mrs. M. M., age thirty-seven years, has been under observation since October 3, 1927. She had a hard mass about 6 cm. by 4 cm. situated at the right vulvovaginal margin. The tumor was removed October 5, and histologic examination showed it to be a mixed cell sarcoma. Patient was given 1500 mg. hours of radium on October 17, and this was followed by deep x-ray therapy.

Nine months later (July, 1928), a small nodule about 2 cm. in diameter developed. This was removed with the cautery, and 600 mg. hours of radium were given. The area healed rapidly.

In October, 1928, the patient returned to the hospital, and examination showed a nodule about 1 cm. in diameter at the upper end of the scar. This growth was dissected out, and 150 mg. hours of radium were given over this small area. A few weeks later she was given deep x-ray therapy, and following this there was an active recurrence.

In April, 1929, patient returned again. Examination showed a necrotic area about 3 cm. in diameter which had not healed. She was then given a 2400 mg. hours' treatment of radium, which had but little effect on the growth. Since then the disease has been progressive, and the outlook is most unfavorable.

The clinical course of sarcoma of the vagina in the adult as in infants offers a poor prognosis. The tumor tends to rapid recurrence with infiltration of the bladder and a fatal termination through interference with the renal function and toxemia. In these cases metastasis is very rare.

Sarcoma which arises from the rectovaginal and vesicovaginal septae has a tendency to invade the deeper tissues, to fill up the pelvis and to give metastasis to the pelvic and abdominal lymphatics. Cases have been reported of metastasis to the lungs, pleura, ribs and axillary glands. These tumors do not confine themselves to the vagina and bladder.

In Williams' list of cases the longest duration of life from the date of the first symptom was twenty-four months, and the shortest, one and one-half months. Spiegelberg had a case of spindle cell fibrosarcoma living at the end of four years. Morris had a patient alive two and one-half years, and Menzel had a patient living at the end of ten months.

Surgery in the treatment of sarcoma of the vagina has been almost a complete failure, as recurrence has taken place promptly, and the ultimate result has been death.

The cure in our third case, that of Miss S. B., if we may term a six-year period a cure, would seem to be due to the use of radium. Surgery in this case was a complete failure, as there was a prompt recurrence after the first operation.

While sarcoma in all parts of the body is usually a rapid and fatal lesion, nevertheless with surgery and irradiation, it would seem that

some cases may be cured. A series of x-ray treatments a short time after the application of radium is of doubtful value. If the malignant process has been checked by the application of radium, additional treatment by x-ray should not be instituted, as it may light up the lesion as in the fourth case, which we now have under observation.

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1737 CHESTNUT STREET.

METASTASIS OF OVARIAN CARCINOMA

BY M. A. TATE, M.D., CINCINNATI, OHIO

IT IS generally believed that ovarian cancers are secondary to cancer of one of the organs within the abdominal cavity or the breast, but we do not know the method of transmission. It would be difficult to find a more important subject for pathologists to take up for serious study, as we are at loss in many of our cases to say just where the primary growth had its beginning.

The lymph channels have been credited as the carriers, and are spoken of as the transporters, yet we cannot omit the influence of gravity and peristalsis without saying that they may be decisive adjuncts to carrying implants to ovarian stroma.

When Sampson brought forth his theory of retrograde carriage during the menstrual period and implantation, he gave us a partially credited explanation for some of the cysts of the chocolate variety formation, but we are still ignorant when neighboring organs are involved in a cancerous mass as to which was the primary seat. Did it begin in the uterus, tubes, or in the ovaries?

Pfannenstiel sums up his deductions as follows: "If the ovarian cancer be associated with a similar type in some distant organ, the ovary is usually secondary, but if it be associated with cancer in adjacent organs, as of tubes or uterus, it is probably of primary origin." (Graves.)

The fallacy of reporting a cure in the case of a simple uncomplicated ovariectomy where no pathologic report was made is demonstrated time and again by a follow-up of the case history. Some of these may be read as follows: patient's recovery apparently uneventful. A few weeks or months after her return home she was seized with violent intestinal cramps—diagnosis, intestinal obstruction. At

operation, or later at autopsy, an overlooked cancerous growth was found, which proved to be the seat of obstruction. The object lesson is that all ovarian growths should be carefully examined and no cure pronounced until pathologist's negative report is received.

The literature abounds with so many case reports that there is no question as to the ovary being prone to secondary cancerous deposits, not only from adjacent organs within the pelvis, but from the thyroid, breast, gall bladder, stomach, and intestinal canal.

Novak says, "It is a striking exception to the old time dictum of Virchow that an organ which is prone to primary cancer is rarely the seat of a metastatic cancer. When uterine cancer or ovarian cancer coexist, either organ may be the primary seat of the disease, or in rare cases it is possible that the two cancers may arise independently of one another. In the pelvis, it is now stated, cancer may extend from the uterus to the ovary by the lymph stream, blood stream, implantation through the tube, and by direct contact." Which of the two, the uterus or ovary, is the primary seat is purely guesswork. Implantation, however, is given little credence by many at the present time.

Sampson offers an explanation of the infrequency of ovarian metastasis as due chiefly to the fact that the great majority of cases of adenocarcinoma of the uterus occur in women well beyond the menopause.

As we know so little of the origin of cancerous tissue, it is natural that we have only theoretical explanations of the coexistence of cancerous tumors which are situated in organs remote from each other, as of the stomach and ovary, or breast and ovary. We have, however, come to know and appreciate this important fact, that if a woman have a cancer of an abdominal organ, or of the breast, no operation should be advised without first determining by a pelvic examination that a coexisting mass does not exist in uterus or ovary. The following case presents some unique findings, the like of which I do not find in my search of the literature.

Dr. Larkin, of Hillsboro, Ohio, asked me to see a patient who had been ill for about a year. She had a very large indefinite mass in the left side of the abdomen (right side free) which seemed to be gradually extending to the median line. His diagnosis was that of malignancy, but what organ was involved was problematical. My first impression was that we were dealing with an enlarged spleen. Patient was sent to Deaconess Hospital, Cincinnati, Ohio, for study and treatment. Age fifty-four years; single; occupation, school-teacher. She had had no sickness other than children's diseases, and one mild attack of influenza some four years ago. Slight build, weight 104 pounds, five feet in height, and color pale. Appetite poor, constipated; menstruation had ceased at age of forty-six. At no time since cessation of menstruation was there any vaginal discharge, nor did she complain of pain.

No history of trauma, and family history free from carcinoma or tuberculosis. She noticed some four months previously that the abdomen seemed to be slightly enlarged; and as this increased, she consulted her physician. At no time did she suffer acute pain; but as the enlargement of the abdomen increased, she com-

plained of a heaviness and a tightness of the abdominal walls. She was up and around attending to household duties until one month before I saw her, and even then she was not bedfast. Her chief complaint was indigestion and gaseous distention.

General physical examination was negative. The abdomen was markedly distended, contained much fluid, and a mass was felt on the left side extending from the ribs to the crest of ilium, extending to within one inch of the median abdominal line. Mass on palpation was even and smooth, and could be slightly moved with the abdominal walls. A marked indentation felt about the center of the anterior edge which corresponded to splenic notch seemed a little more pronounced with patient on her right side. No pain was elicited either on palpation or percussion. The doctor informed me that some months previously he had detected some masses along the descending colon which spread rapidly and coalesced into this one large mass. Rectal examination elicited no pain, body of uterus or mass could not be felt, but cervix was small and negative. The legs were not swollen. Wassermann test was negative.

<i>Red Count</i>		<i>White Count</i>	
Red corpuscles, per c.mm.,	3,944,000	Leucocytes, per c.mm.,	4000
Hemoglobin	70 per cent	Differential count (percentage):	
Color index	0.84	Polymorphonuclears	76.0
Poikilocytes	None	Small lymphocytes	17.0
Microcytes	None	Large lymphocytes	2.5
Macrocytes	None		
Nucleated red cells:			
Normoblasts	None	Eosinophiles	2.0
Megaloblasts	None		
Achromia	None	Transitionals	2.0
Bacteria	None		
Parasites	None	Basophiles	0.5
Platelets	Normal	Myelocytes	None
Stipple cells	None	Irritation forms	None
Reticulated reds	None		

Laboratory Diagnosis.—Marked secondary anemia with leucopenia and relative polymorphonuclear leucocytosis.

The x-ray examination of the stomach, made fluoroscopically and with film, showed it to be normal; the duodenum was normal. The thirteen hour p.c. examination showed very marked delay, however, in the emptying time of the stomach, and very slow progress of the opaque meal through the distal portion of the small intestine. At the twenty-four hour examination there was again shown some barium in the distal portion of the small intestine. A barium enema given under fluoroscopic observation showed the entire colon to fill without evidence of obstruction or deformity as far as the cecum.

The simple examination of the abdomen with the Bucky film showed no direct evidence of tumor mass, but at no time showed a definite outline of either kidney. I felt that this latter might be due to the accumulation of some fluid, or free fluid in the peritoneal cavity, as the film showed the general hazy appearance associated with fluid in the peritoneal cavity.

We were unable to demonstrate any obstruction, and the slowness of the passage of the meal through the small intestine might have been due to secondary adhesions, or to the presence of fluid and the distention in the abdomen, causing a marked lessening of the peristaltic activity.

The palpable hardness in the left side of the abdomen, if present, or adhesions, if present, were also not shown on the film, though they might be tuberculous in type. The lower dorsal, lumbar spine, and pelvic bones appeared normal.

After repeated examinations, Drs. Larkin and Bettman, and I decided that an exploratory incision was justifiable. The provisional diagnosis was a malignant process of uncertain origin.

A median incision was followed by the escape of three gallons of straw-colored fluid. The extensive growth proved to be an involvement of parietal peritoneum, which extended from the sternum and ribs down the median line of the abdomen to the crest of the ilium, then back to the spine. The right parietal peritoneum was not involved. On the anterior surface just below the umbilicus, a marked indentation was noted, which on first examination, I thought might be the splenic notch. This mass extended entirely over the left kidney and splenic regions. The stomach, gall bladder, liver, kidneys, spleen, and upper intestines appeared to be free of any growth or enlargement. The intestines, however, below the umbilicus were studded with numerous small growths, from the size of a pinhead to that of a small pea, and were not unlike miliary tubercles.

In the upper false pelvis a conglomerated mass (size of an orange) was seen, which proved to be the ovaries, tubes, and uterus. Numerous firm bands extended from this mass to the peritoneum, intestines, and pelvis. A section was taken from the involved peritoneal growth. The mass in the pelvis was not disturbed, and we did not look for the appendix.

The abdomen was closed by through-and-through silkworm-gut sutures, and a small drainage tube was inserted into the lower angle of the incision.

Laboratory Report.—Specimen was taken from peritoneum of abdominal wall. Frozen sections revealed large spaces lined by one layer of cuboidal epithelium, which in some places was becoming markedly hyperplastic, with ragged basement and invasion of surrounding tissue. Mitotic figures were numerous and well formed. There was a very dense cellular stroma, somewhat suggesting that found in the submucosa of smooth muscle, but it was mostly fibroblastic tissue. The large size of the epithelial lined spaces suggested a possible mucinous or colloid content, which, however, was absent in the frozen section.

The gross specimen was of firm, slightly nodular consistence, and was slightly blood stained. Section revealed fatty tissue streaked with gray-white firm material, which was not well demarcated. Paraffin sections from various portions of the tumor mass were blocked and stained with the routine hematoxylin and eosin method. These sections showed a bewildering assortment of cells. The stroma was fairly consistently composed of mucoid, connective tissue, and some collagenous connective tissue in which were embedded glandular structures, some of which were lined with cylindrical distorted epithelium, and some of which showed several layers of cuboidal cells. In other places there were papillary outgrowths of this cuboidal epithelium. In one portion there was a mass of epithelium, totally different from that encountered elsewhere in the tumor. This was composed of deeply staining epithelium sometimes arranged in gland ducts, and sometimes in solid plugs. Although mitotic figures were found elsewhere, they were most numerous in this group of cells. From this diversity in cell type and grouping, it would appear that we were dealing with an embryonal malignant type of growth often encountered in the ovary and frequently seen in the kidney, especially seen in young subjects; the prognosis is very bad.

Diagnosis.—Metastatic adenocarcinoma.

Three weeks following operation the patient returned home, but she lived only three months.

RUPTURE OF THE UTERUS, WITH REPORT OF SEVENTEEN CASES

BY IRVING W. POTTER, M.D., BUFFALO, N. Y.

OWING to the many operations upon the uterus, rupture of that organ will be found very frequently as a complication of pregnancy, and is a condition we must be prepared to meet at once.

Let us first consider the uterus. It is a hollow muscular organ with more or less thick walls and is made up of three layers of muscles. We know from our work upon the pregnant uterus that fully 50 per cent of the uteri have some pathologic condition, in that they either contain one or more of the many kinds of tumors common to that organ, or the walls have been weakened from dystocia of the maternal or fetal type, or some of the acute infections have damaged the muscle and have invaded the walls and may have contributed to the various displacements found.

If we consider labor a natural physiologic act through which the woman should pass without injury, we must assume that normal conditions exist in the uterus and pelvis, and in the size of the child. But with a damaged uterus such a condition as a normal physiologic process cannot exist, consequently rupture of one or more, or all of the layers of the uterus is liable to occur and therefore trauma is a frequent cause of rupture; trauma as results from long labor due to maternal or fetal dystocia.

Think back to the years when labors of three or four days' duration were not uncommon, with the uterus contracting violently for a number of hours until muscular exhaustion occurred, followed by periods of rest; and then a recurrence of the contractions took place until finally the child was pushed out into the world and the patient, greatly exhausted by such a labor, gradually rallied; but about the third or fourth day she developed a temperature, rapid pulse, distention of the abdomen, delirium, vomiting, and finally obstruction of the bowels and death. The attendant was charged with having had a case of puerperal fever; and yet these patients, in the light of our present knowledge, had many times, no doubt, a partial rupture of the uterus with escape of the uterine contents into the peritoneal cavity, causing the above symptoms.

Articles are now appearing in the journals advocating the induction of labor by the frequent use of pituitrin and, with our knowledge of the pathologic conditions so frequently found in the uterus, it does seem that such a procedure cannot help but be extremely dangerous and that rupture of the uterus might be an accident which it would

be reasonable to expect. When one sees the rapid and firm contractions of the uterus produced by pituitrin (giving it as we give it by hypodermic injection into the uterine tissue after a cesarean section wound has been closed), one cannot help but be surprised that this disastrous accident does not occur even more frequently.

Rupture of the uterus can be produced by the improper application of forceps, such as application of forceps to the outside of the uterine body (a case was recently seen in consultation where this had been done), application of forceps through an undilated os, application of forceps to an improperly engaged head, attempts to perform version in a case where the uterus is too tightly moulded around the child to allow of its being lifted up, and where the membranes have ruptured early, allowing the amniotic fluid to drain away. Any attempt to correct a neglected shoulder presentation, with an arm protruding, is a frequent cause of rupture of the lower uterine segment; in fact, any violent intrauterine procedure when attempted without complete surgical anesthesia could produce a rupture. Cases where the uterine wall has been weakened by the removal of a fibroid tumor or where any inflammatory process has been present, or where one or more cesarean sections have been done, either abdominal or vaginal, especially where the abdominal has been done by the high operation, or in the low two-flap operation, are always to be watched carefully for rupture. Symptoms vary according to whether the rupture is complete or incomplete, whether at an old cesarean scar or in the tissue adjoining the scar, and also as to where the placenta is located. In our specimens sent to the laboratory we have found that muscle tissue is not replaced, and there exists always much fibrous tissue, which has not the power of contracting and relaxing as muscle tissue does; hence, the greater danger of rupture where there is extensive scar tissue which is found in spite of the great vascularity of the uterus in many cases. Incomplete or partial rupture is accompanied by steady and persistent pain in the abdomen, increased size of the abdomen with board-like rigidity, and when there is a sudden cessation of pain, complete rupture must be suspected.

Rupture at term occurring at the seat of an old cesarean scar may cause no special symptoms. The uterine scar simply opens; and, if the placenta is on the posterior uterine wall, the membranes protrude, and a mass is found under the skin of the abdomen, which is readily seen to contain fluid and to fluctuate. Careful examination at the base of this mass reveals the sharp, well-defined edges of the uterine scar. We have had two such cases; both patients were up and doing their housework until told of the condition. There is no pain in this type of rupture.

Rupture at the placental site with the placenta being pushed out into the abdominal cavity is a different picture. In that case there is pain,

continuing until the complete rupture occurs, when the pain ceases, and symptoms of shock due to hemorrhage appear. These patients bleed to death through hemorrhage into the abdominal cavity unless quickly operated upon. Another type of rupture is seen where the fetus is pushed through the rent in the uterine wall, the placenta remaining attached and very little hemorrhage occurring; the child may live for some time, floating about in the coils of intestine, and the uterus retracting and falling down into the pelvis. No special harm to mother or child is found to occur in this type of case if it is recognized early and operation is performed as soon as possible.

The most dangerous type is the one where the uterine wall is very thin and is torn in different directions and both the placenta and the child are expelled into the abdominal cavity accompanied and followed by severe hemorrhage and resulting in death of the mother and child.

A patient, seven or eight months pregnant, complaining of abdominal pain getting more severe, with no intermission, the abdomen becoming distended and board-like to the touch and then with a sudden cessation of pain and the symptoms of shock appearing and getting more profound as time goes on, should be suspected of having a rupture of the uterus. Treatment of this condition is, of course, surgical. The abdomen should be opened and explored, and whether the rupture should be repaired, or whether the uterus should be removed, must be determined by the individual operator. In the cases where the unruptured membranes protrude, the edges of the uterine scar can be freshened after the child and placenta are removed and the tear is repaired. In cases where the placenta is retained and the child is free in the abdominal cavity, the uterus can sometimes be repaired. The cases of extensive rupture in different directions, with the child and placenta in the abdominal cavity, are best treated by removal of the uterus at once.

Where rupture has occurred and the uterus is left, resection of the tubes should be done. The maternal mortality is highest in the last type of case; namely, with the rupture in different directions. The fetal mortality is highest in the last two types of cases, while in the first group described there should be neither maternal nor fetal mortality if treated early.

In our series of 1750 abdominal and vaginal cesarean sections the following ruptures have been known to occur. In the series of 43 vaginal cesarean sections none occurred. In the abdominal sections where the high, medium, and low types of operation were used, they were found as follows:

CASE 1.—Mrs. W., aged thirty, para iii, was seen in consultation with a midwife, who had been in attendance twelve hours. There was neglected shoulder presentation and a hand protruding. Attempts had been made to deliver by traction on the arm. The parts were greatly swollen and discolored, with many abrasions. Chloroform was given and a careful examination was made for suspected rupture; a still-

born child was delivered by version and extraction and then examination was made to ascertain whether or not a rupture existed. None could be found. The patient died in twelve hours. Postmortem examination showed a triangular tear in the lower posterior uterine wall. This patient had never had any operation on her uterus.

CASE 2.—Para ii, aged twenty-two. First abdominal cesarean section was done in July, 1922, for placenta previa with severe hemorrhage at seven months; cervix was long and undilated. Child and mother both well. The patient was seen in Cleveland by Dr. A. J. Skeel in 1925 when six months pregnant and was sent to his hospital for observation. Diagnosis of rupture was made; operation and recovery. This case was reported to me by Dr. Skeel.

CASE 3.—Para ii, aged nineteen. The patient was told to report at the first sign of labor. Instead of doing this, she was all night in labor. When seen in the morning, rupture of the uterus was diagnosed; and she was operated upon at once. We found protrusion of membranes through the old scar. Mother and child recovered. The tubes were resected.

CASE 4.—Mrs. C., para v. At term this patient was to have a third abdominal cesarean section. Seen at her home, a diagnosis of rupture was made, and she was taken to the hospital. A stillborn child was removed; the abdominal cavity was full of blood clots, and the placenta was protruding through the rupture. The old scar was removed and the uterus was sewed up and left. Patient recovered.

CASE 5.—Mrs. B., aged thirty-four, para ii. Diagnosis of rupture was made in my office. Patient was sent at once to the hospital and operated upon. Unruptured membranes were protruding through rupture. Recovery of mother and child.

CASE 6.—Mrs. McC., para ii, aged twenty-three, was to have had a second abdominal cesarean section. There was rupture of the scar necessitating operation; old scar was removed and tubes were resected. Recovery.

CASE 7.—Mrs. P., para ii, aged thirty-two, was to have had a second abdominal cesarean section. There was spontaneous rupture of uterine scar at term. Membranes protruded, old scar was removed, and tubes were resected. Mother and child recovered.

CASE 8.—Mrs. F., para ii, aged thirty-eight, was to have had at term a second abdominal cesarean section. When seen at home, she had severe pain, was vomiting, and in shock; diagnosis of rupture of uterus was made. Morphine sulphate, gr. $\frac{1}{4}$, was given by hypodermic injection. She was removed to hospital in ambulance; operation was performed immediately. A dead child was found free in the abdominal cavity, and placenta was still attached. The opening in uterus was closed, and tubes were resected. Recovery of mother.

CASE 9.—Mrs. E., aged thirty-seven, para iii. Seen in consultation. She had had two abdominal cesarean sections. Diagnosis of rupture was made. At operation a dead child was found and the placenta was found in the abdominal cavity. Hysterectomy was performed. Recovery of mother.

CASE 10.—Mrs. S., aged thirty-one, para ii, was to have had at term a second cesarean section. Diagnosis of ruptured uterus was made; operation showed membranes unruptured; tubes were resected. Mother and child recovered.

CASE 11.—Mrs. A., aged thirty-one, para iv. Last child was delivered by abdominal cesarean section because of central placenta previa. When seven and a half months pregnant, following a day of hard work, she was taken with severe abdominal pain. A diagnosis of rupture of uterus was confirmed by operation; live child delivered and mother recovered.

CASE 12.—Mrs. P., aged twenty-eight, para ii, near term; to have a second abdominal cesarean section. She had severe abdominal pain, and was taken in my own car to the hospital where diagnosis of rupture was confirmed by operation. Both tubes were resected. Recovery of mother and child.

CASE 13.—Mrs. R., aged thirty-three, para ii, seven months pregnant. Uterus ruptured while patient was in a department store shopping. She was taken to the hospital and operated upon. A live child was delivered, but it only lived six hours. Uterus was removed. Recovery of mother.

CASE 14.—Mrs. C., aged thirty-eight, para ii, had a cesarean section, six years ago. Her physician told her not to become pregnant again, but he did not remove her tubes. I saw her at her home nineteen hours after her first symptoms of severe abdominal pain, followed by shock. She was removed at once to the hospital by ambulance, but died in twenty minutes after being admitted. Dr. Milton Potter, who was present when she was admitted, did a postmortem laparotomy in the hope of saving the child, but was unsuccessful. Child and placenta were found in abdominal cavity. He removed the uterus and found a tear at site of an old scar.

CASE 15.—Mrs. S., weight 84 pounds, para ii (first section, Feb. 16, 1927, for contracted pelvis). When eight months pregnant, she was seized with irregular pains eight hours before entering the hospital. They became more severe; but, not thinking they were of any importance, she continued with her household duties until 2 P.M., when, after reporting her condition over the telephone, she was taken to the hospital. On the way there was a sudden cessation of pain. Patient felt better but was weak. I saw her shortly after admittance to the hospital and a diagnosis of rupture of the uterus was made. No fetal heart sounds could be heard. A soft, boggy mass could be pushed all over the abdominal cavity. Patient showed slight shock. Her skin was cold but she had a fair pulse. She was given 1000 c.c. of 5 per cent glucose solution subcutaneously and was operated upon immediately. Upon opening the abdomen, a number of large blood clots were found, and the unruptured sac containing the child could be easily felt. The membranes were ruptured and a dead baby of about eight months was removed, followed by placenta and membranes. No active bleeding was observed. I then brought the uterus up from down in the pelvis and removed it, closing the abdomen without drainage after putting 1000 c.c. of 5 per cent glucose solution into the peritoneal cavity. Patient was given more glucose under the breasts, and she made a perfect recovery, leaving the hospital in twelve days.

CASE 16.—Mrs. P., para ii, seven and a half months pregnant. First section was done twenty-two months ago for contracted pelvis. Patient was taken with pain in abdomen, resembling labor pains at 4 A.M.; she entered the hospital at 7 A.M., when pains stopped. When seen at 9 A.M., her abdomen was soft and boggy; she had a fair pulse and some evidence of shock. There was slight vaginal discharge; an abdominal mass could be pushed all around. No fetal heart could be heard. A diagnosis of rupture of uterine scar was followed immediately by operation. An unruptured sac was found in the abdominal cavity; uterus was removed. Patient recovered, leaving the hospital in thirteen days. The histories of this case and of the previous one were the same.

CASE 17.—Mrs. L., aged twenty-seven, para iv, was seen in consultation at 9 P.M. She had one living child, delivered by abdominal cesarean section, two years ago. Two other children were lost during delivery. Patient began having severe abdominal pain at noon. She was seen by her physician at 4 P.M., and entered the hospital at 6:30 P.M. When I saw her at 9 P.M., she was in shock. Ruptured uterus was diagnosed and immediate operation was advised. Upon opening the abdominal cavity, a large amount of blood clots were removed and the unruptured sac con-

taining a 7 months' dead fetus was taken from the peritoneal cavity. The uterus was brought up out of the pelvis and removed. A blood transfusion was given but patient died at 2 A.M. from shock and hemorrhage. This patient could have been saved had an early diagnosis been made.

In this group of 17 patients there was a maternal mortality of 3 and a fetal mortality of 9, and in 8 cases mother and child were both saved. One patient who died was a woman who had never had a cesarean section.

Sixteen of these cases occurred in my own practice. One case I am indebted to Dr. A. J. Skeel, of Cleveland, for the privilege of reporting.

SUMMARY

This paper emphasizes: first, the signs and symptoms of rupture of the pregnant uterus; second, the time in pregnancy when we have found rupture to occur; third, the necessity for careful watching of all cases where rupture might be expected, say after the sixth month of pregnancy, because the uterus raises itself out of the pelvis and the tension is greatest because at this time it grows most rapidly; fourth, the fact that gross pathology is found more frequently in the uterus than is generally supposed, and the chief among these pathologic conditions is fibroids, particularly of the intramural type.

689 FOREST AVENUE.

VARIATION IN THE LENGTH OF LABOR

BY L. A. CALKINS, M.D., PH.D., KANSAS CITY, MISSOURI,

JED H. IRVINE, M.D., AND GUY W. HORSLEY, M.D., UNIVERSITY, VIRGINIA

OBSTETRIC literature is replete with articles dealing with prolonged labor. Beyond discussing such cases as brow and shoulder presentation, most of these articles are concerned with uterine inertia, primary or secondary. There is also a smaller number of contributions describing the pathologic possibilities of short labors. A rather careful search has not revealed any considerable contribution to the study of labors, the lengths of which might be said to be within normal limits.

The following discussion is the result of a statistical study of some 1250 consecutive labors in the University of Virginia Hospital. Abnormally long labors were excluded, because their small number was not statistically significant. The elimination of these few abnormally long labors does not in any way impair the accuracy of the results as averages are not considered. The study covered such items as age and parity of the mother, height and weight of the mother, length of gestation, length of conjugata vera, and height and weight of the child.

Each of these factors was studied for its effect on the length of the first stage, on the length of the second stage, and on the total duration of labor. Two methods of analysis were employed:

1. Pearson's coefficient of correlation. (For description of the use and interpretation of this coefficient, see AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, April, 1929, pages 278-282 and in *Transactions American Association of Obstetricians, Gynecologists, and Abdominal Surgeons*, 1928, pp. 136-140.)

2. Regression lines plotted on coordinate paper. The coefficients of correlation were fairly striking, and they are herewith presented for purposes of comparison with any later or more complete studies.

TABLE I (A). FIRST STAGE OF LABOR

Age of mother	-.088	±.022
Parity of mother	-.280	±.016
Height of mother	-.045	±.026
Weight of mother	-.019	±.026
Length of gestation	+.021	±.026
Conjugata vera	+.095	±.023
Height of child	-.045	±.023
Weight of child	-.049	±.021

TABLE I (B). SECOND STAGE OF LABOR

Age of mother	-.133	±.026
Parity of mother	-.366	±.014
Height of mother	-.030	±.023
Weight of mother	+.056	±.019
Length of gestation	-.027	±.030
Conjugata vera	-.063	±.026
Height of child	+.085	±.024
Weight of child	+.018	±.021

From the data in Table I it is quite evident that none of the factors save age and parity of the mother have any effect on the length of either the first or the second stage of labor. The coefficients are consistently small and in many instances no larger than their probable errors. Age of the mother would seem to be inversely proportional to the length of both the first and second stages and this is, of course, actually true, when we consider all cases. If primiparous and multiparous labors be analyzed separately we have:

Primiparae—Age of mother; First stage	+.016	±.038
Primiparae—Age of mother; Second stage	-.031	±.038
Multiparae—Age of mother; First stage	-.070	±.032
Multiparae—Age of mother; Second stage	-.030	±.032

Age thus loses its significance and apparently has no effect on the duration of either the first or second stage. Parity alone then has a high (negative) coefficient and clearly affects the length of labor. The decrease is almost entirely confined to the space between primiparae and secundiparae as will be seen in Fig. 1.

Beginning with secundiparae there is no further decrease in the first stage of labor with succeeding pregnancies. The irregularity in the

Fig. 1a. Clinical Factors Affecting the Duration of Labor

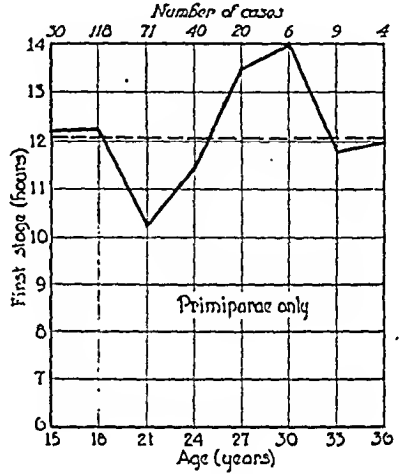
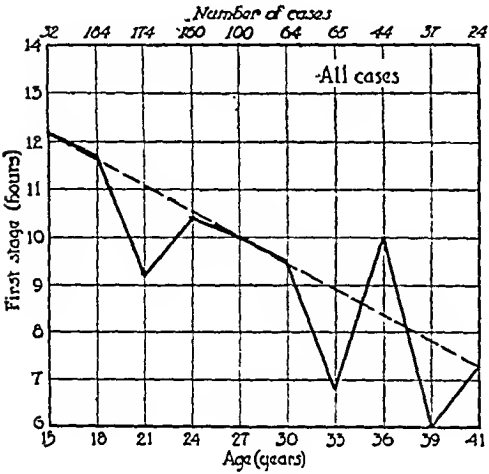
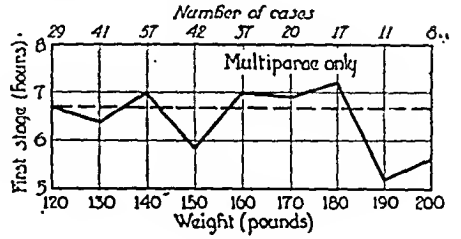
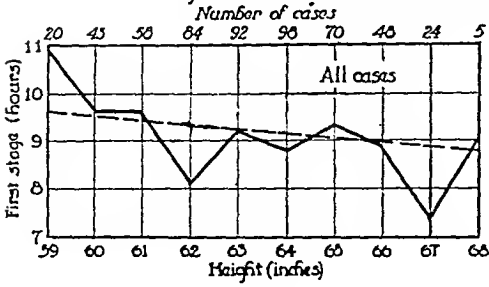
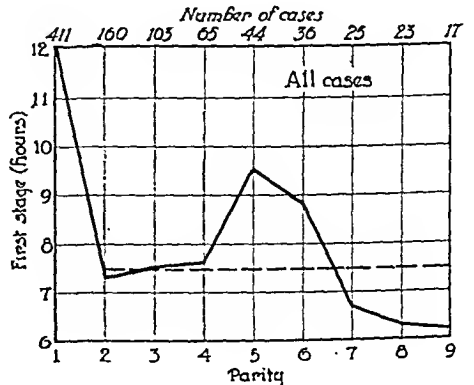
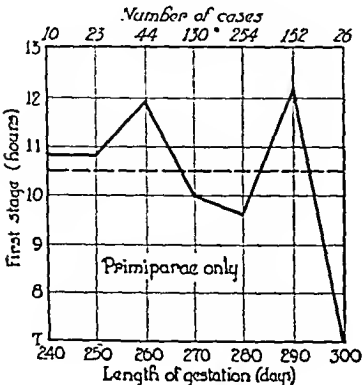
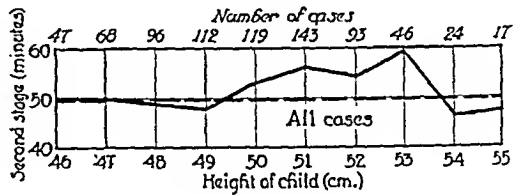
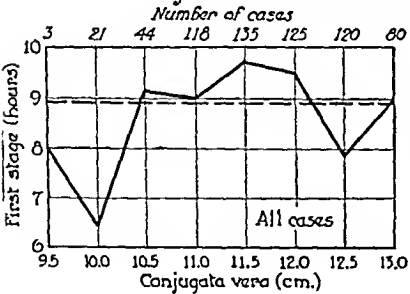


Fig. 1b Clinical Factors Affecting the Duration of Labor



curve (Fig. 1 *b*) is not significant. There would seem to be some further shortening of the second stage after the sixth labor although, for practical purposes, one may doubt the significance of so small a change.

The effect of age of the mother is clearly demonstrated by the curves in Fig. 1 (*a*). The apparent inverse relation to age (all cases) is lost when primiparae alone are considered. (Multiparae alone also show a horizontal line.)

All other curves may be regarded as horizontal lines and the conclusion that none of these factors affect the length of either the first or the second stage of labor would seem justified.*

The shorter second stage of labor in multiparae might be explained on the basis of decreased resistance of the cervix, vaginal walls, and pelvic floor. In fact, one might hazard the guess that the *duration of both the first and the second stages of labor is the product of the character of the labor pains on the one hand and the resistance of the soft parts on the other.*

SUMMARY

1. The almost completely negative results of this study would seem to controvert certain beliefs; e.g., the long labor of the fat woman, the long labor of the elderly primipara, and the long labor of the woman with a small pelvis (9.5 or 10.00 cm. conjugata vera) or a large baby.
2. We believe that further studies of the variation in the length of labor will be hereby simplified.

*Coefficients of correlation were computed for primiparous labors, for multiparous labors, and for strictly normal labors, weighing each of the eight factors (age, parity, height and weight of the mother, height and weight of the child, conjugata vera, and length of pregnancy) against both the first and second stages. Curves were plotted covering all of these various relationships. All these coefficients are essentially zero, and the curves are horizontal lines. It seemed, therefore, that publication of them was unnecessary.

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Original Communications

FETAL BACTEREMIA; A CONTRIBUTION TO THE MECHANISM OF INTRAUTERINE INFECTION AND TO THE PATHOGENESIS OF PLACENTITIS*

BY ALFRED J. KOBAK, M.S., M.D., CHICAGO, ILL.

INFECTIONS of the fetus in utero and the associated changes in the placenta are problems which warrant further scientific investigation. It is recognized that almost all the communicable diseases that may affect a pregnant woman may be transmitted to the fetus. Few references in the literature make mention of the part played by the placenta in the presence of infection. Only the better known histologic pictures of chronic diseases, such as syphilis and tuberculosis, are emphasized. During the third stage of labor it is customary at the Michael Reese Hospital routinely to withdraw the umbilical cord blood for use in the laboratories. This blood occasionally yielded a streptococcus or other organisms, and in order to determine in what manner the umbilical blood becomes infected, before or during labor, a series of three hundred and seventy-seven fetal blood cultures, drawn aseptically, were studied. When evidence of infection was present, the placenta was examined histologically.

*From the Otto Boer Fund for Clinical Research and Obstetrical Department of the Michael Reese Hospital and the Nelson Morris Institute for Medical Research, and from the Department of Bacteriology and Pathology of the University of Illinois, College of Medicine.

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REVIEW OF THE LITERATURE

Although there are many papers on this subject in the literature prior to Hellendahl's¹ classical investigation, yet renewed interest and our present knowledge of the transmission of disease in utero are due to this author's meritorious work. He demonstrated, experimentally and clinically, three possible routes by means of which microorganisms might reach the uterine cavity and fetus:

1. Through the vagina, with or without ruptured membranes.
2. From the abdominal cavity through the fallopian tubes.
3. From the uterine wall by means of maternal vessels.

Ascending infection through the vaginal portal is frequently referred to in the literature. As early as 1888, Winter² stated that organisms, either previously present or introduced from without, were aspirated by means of uterine contractions and caused febrile abortions. Hellendahl³ points out that the bacteria in early abortions are sometimes picked up from the ever-present vaginal flora by contact with a suspended clot through the cervix. These organisms spread upward along the membranes and are present in the placental tissue.

Warnekros⁴ shows that intrapartum fever is often associated with premature rupture of the fetal membranes and demonstrates the organisms in the placenta. This study of twenty-five cases revealed a positive maternal blood culture in eighteen. The organisms were previously present as a part of the vaginal flora or were introduced manually in the vagina with subsequent invasion of the uterus. It was demonstrated that they entered the intervillous spaces by two possible routes: (1) by invasion through the fetal membranes; and (2) by insinuation between the membranes and uterine wall, then to break through the decidua into the intervillous spaces or maternal blood stream. This investigation does not include a study of the fetus.

Other contributions emphasize the possibility of infection of the amniotic fluid in premature rupture of the fetal membranes. Delmas,⁵ Browne,⁶ Dodd,⁷ and Hook⁸ record instances in which the baby developed pneumouia from an aspiration of the infected amniotic contents. Audibert and Laurentie⁹ review a case in which aspiration of the infected amniotic fluid was fatal to the fetus, and the mother died of puerperal sepsis. Burnett¹⁰ found micrococci present in the fetal membranes, and concludes that the organisms ascended from the vagina after a prolonged communication with amniotic cavity.

While free communication with the uterine cavity is best suited for upward extension of microorganisms, Liudenthal,¹¹ on the other hand, reports the presence of foul and fetid amniotic fluid upon artificial rupture of membranes. In a study of two hundred women with intrapartum infection, Ihm¹² found the bag of waters intact in sixteen cases. Harris¹³ concludes that infection of the uterus takes place six hours after the onset of labor regardless whether the membranes are intact or ruptured. Later Harris and Browne¹⁴ corroborate this when, under the same conditions, bacteria were found in the liquor amnii withdrawn at cesarean section. Hellendahl¹ experimentally established that an intact bag of waters is an insufficient barrier to the upward extension of organisms introduced into the vaginal canal. The organisms extend either through the membranes into the amniotic cavity or upward between the membranes and the uterine wall to the placental site.

Hellendahl¹ also reviewed other routes by which microorganisms reach the fetus. After inoculating organisms into the peritoneal cavity or into the blood stream, he was able to recover the bacteria in the amniotic fluids and fetuses. This was confirmed clinically by cases of abdominal infections, or systemic diseases that were transmitted to the fetus. An excellent example of abdominal infection with

secondary involvement of the fetus is the case cited by Sembs¹⁵ in which a localized appendiceal abscess was walled off by the right tube and ovary. Pus extended into the tube and in the horn of the uterus where an abscess, about the size of a dollar, was present in the decidua.

Practically all the communicable diseases which affect the mother may be transmitted to the fetus. Ballantyne's¹⁶ text, and the excellent and comprehensive monograph of Hinselmann¹⁷ review the subject of transmission of diseases in utero. The following maternal infections are reported to have been transmitted to the fetus in utero: anthrax,¹⁸ diphtheria,¹⁹ pneumococcus,^{20, 21} smallpox,^{22, 23} influenza,²⁴ epidemic encephalitis,²⁵ malaria,²⁶ typhoid fever,²⁷ and a host of nonspecific organisms. DeLee²⁸ and Cornell²⁹ report the possibility of certain stillbirths due to fetal infections, and have found organisms in the dead fetuses. Recently Walser³⁰ cultured *Streptococcus viridans* in the maternal blood stream during pregnancy, and in the placental blood of the baby at birth in a case of subacute bacterial endocarditis.

Lubarsch³¹ inoculated a number of pregnant animals with bacteria and examined the fetal organs and the placenta. For the transmission of infection to the fetus in utero, Lubarsch concludes that certain factors play an important rôle, namely, the duration of the infection, the number of organisms in the blood stream, and the type and virulence of the organisms.

To summarize the literature thus far cited, it is apparent that the views of Hellendahl are corroborated clinically by other investigators, namely, that bacteria may reach the fetus from the vagina as an ascending infection; from the maternal blood stream; and from the organs surrounding the uterus. The amniotic contents infected from the vagina are frequently aspirated by the fetus and give rise to intrathoracic infections. They may be swallowed and likewise cause gastrointestinal complications (Hook). Asehoff³² cites a case of fetal otitis media that probably originated through the eustachian tubes when infected amniotic fluid was swallowed.

It is frequently recognized that the fetus may become infected in transit by contact with the vaginal flora, and that certain skin and eye infections may follow. Noacke,³³ studying infections from the vaginal flora, points out that the suckling infant, contaminated by the vaginal and amniotic contents, may infect the mother's breast. The conclusions were based on three cases in which the organisms of the infected breast were similar to those in the vagina of the mother and the mouth of the baby.

The literature is more or less replete with references concerning the transmission of bacteria and their toxins through the placenta. Schmidlechner³⁴ was the first to point out experimentally that it was possible for toxins to reach the fetus through the placenta. He suggests that immunity as well as intoxications may thus be transmitted. Howell and Eby³⁵ more recently demonstrate that specific immune bodies are transmitted from the mother to the fetus. Theobald Smith³⁶ produces evidence that abortions occurring in cattle may result from a specific infection of the uterine contents. Sandke,³⁷ in his inaugural dissertation, shows that fetuses are infected when the pregnant mother is inoculated with bacteria. Aborted fetuses are considered examples of a lack of resistance, and the amniotic cavity contents and fetal membranes show a widespread distribution of the organisms. Later this investigator observed that full-grown fetuses of domestic animals succumbed to intrauterine infections. He indicates that in addition to the circulatory routes the amniotic waters also become infected through the cervical os, and that the fetus might then become infected by aspirating or swallowing this infected fluid.³⁸ A streptobacillus, isolated by Massay,³⁹ appears to pass readily through the placenta and affect the fetuses of guinea pigs. Brown and Kincaid⁴⁰ isolated a

streptococcus from human puerperal blood and recovered the same type of organisms in the fetuses of rabbits that were inoculated with the bacteria.

Inflammation of the placenta is thoroughly studied by Slemmons⁴¹ who shows that the leucocytic reaction is more or less limited to the fetal surfaces. Because of the superficial course of the large chorionic fetal vessels, he assumes that organisms might thus readily enter the fetal circulation. Gracff⁴² and later Ikeda⁴³ conclude that the leucocytic infiltration on the fetal surface is due to a positive chemotaxis in the liquor amnii and believe this may be an aseptic process. It is their belief that the H-ion concentration of the amniotic fluid is increased and attracts the leucocytes from the fetal vessels and the intervillous spaces toward the fetal cavity. Laubscher⁴⁴ believes that inflamed placentas arise from the organisms ascending through the cervical os and finds that the placental pole nearest the vagina shows greater inflammatory change. Creadick⁴⁵ cites a case of long dry labor in which the placenta contains many streptococci. In a study of forty-eight placentas with inflamed membranes, Siddall⁴⁶ finds that prolonged rupture is the most frequent underlying factor and considers that an intrapartum fever, in the absence of any other known cause, is due to an intrauterine infection. Greenhill⁴⁷ reports a case of intrapartum fever in a patient whose labor was induced by a Voorhes bag and finally terminated by Dührssen's incision of the cervix and Kielland forceps extraction. Although the child lived, bacteria were seen on the fetal and maternal side of the placenta, and in clumps within the villous vessels. A recent paper by Wohlvil and Bock⁴⁸ describes marked placental inflammation and bacteremias in the corresponding fetuses. In their study, limited to pregnancies of three to five months, these authors believe that placentitis is secondary to the fetal infection, a contention that is not fully supported by our study.

TECHNIC

The following described technic was used throughout this investigation: Immediately after the delivery of the baby the cord was fixed by a loose tie, and cleansed with alcohol and iodine. By means of a large bore needle directed toward the mother, the blood was aspirated from the distended umbilical vein and cultured in 2 per cent glucose veal broth P_H 7.6. All bacterial studies were confined to aerobic methods. The placentas were studied histologically, (1) in all cases where the mother had a prolonged labor, (2) where the membranes had been ruptured over twenty-four hours, (3) in all cases of intrapartum fever, and (4) when the blood cultures were positive. Sections were taken from each quadrant, of the placenta, from the vicinity of the large blood vessels, from the cord, and the reflecting membranes. Zenker formaldehyde and later only formaldehyde solution (10 per cent) were used as fixatives. The sections were stained routinely with hematoxylin and eosin; and with MacCallum, Gram-Weigert or methyl green pyronin for bacterial study. Cultures were also taken from the pleural cavity and hearts of babies dying before or shortly after birth. Histologic examinations were then made on sections from the heart, lungs, and other viscera. Morbid changes in the newborn were studied bacteriologically when possible. In four instances a maternal blood culture was taken when there was a definite intrapartum fever.

RESULTS

A series of 374 consecutive cord blood cultures was studied by aerobic methods. Thirty-four, or 9.09 per cent, of these were found positive. Three more cultures, taken from patients with prolonged and dry labors, were later added to this series. The following organisms were recovered:

	CASES
<i>Streptococcus fecalis</i>	3
<i>Streptococcus anhemolyticus</i>	3
<i>Staphylococcus albus</i> (one strain being quite hemolytic)	7
<i>Staphylococcus aureus</i>	1
<i>Bacillus coli</i>	8
<i>Bacillus fecalis alkaligenes</i>	5
Diphtheroids	9
<i>Pneumococcus</i> (Group II)	1
<i>Diplococcus</i> (gram-positive)	5
<i>Micrococcus catarrhalis</i>	1

In five cases two types of organisms were recovered from a single cord blood culture. *Bacillus coli* was associated with *streptococcus fecalis* twice, once with an anhemolytic streptococcus and once with a gram-positive diplococcus. *Staphylococcus albus* and a gram-positive diplococcus were present in the fifth cord blood culture.

Bryce,⁴⁹ in a very comprehensive study, shows that these bacteria may be included in the normal vaginal flora during pregnancy. It is also of interest to note that the organisms isolated by Harris and Brown from the amniotic fluid at cesarean sections were similar to those in our series. They recovered streptococci of various strains (but none of the mannite fermenting group), diphtheroids, and staphylococci in the order given, and also an occasional yeast, *Clostridium welchii*, Döderlein's bacillus, or *Actinomyces pseudonecrophorus*. In brief, the organisms that are present in the normal vaginal flora may infect the amniotic fluid and later invade the fetal blood stream.

THE PLACENTA

Placentas were examined in all instances of prolonged rupture of the membranes, intrapartum fever, or when the cord blood culture was positive. Histologic studies were made on forty-two such placentas, of which only twelve had definite inflammatory changes. The cord blood culture findings of the latter were distributed as follows: seven were positive, three were negative, one culture was contaminated, and one was lost. The clinical histories of these twelve cases show that all the labors were prolonged, and in ten cases the mother had intrapartum fever. The bag of waters in all instances of placental inflammation had been ruptured more than twenty-four hours with the exception of one case (eleven hours.) Three of the cases had ruptured membranes for as long as four days or more.

The liquor amnii of one of the babies with a negative cord blood culture was found, at cesarean section, to be frankly purulent, and when cultured yielded diphtheroids which overgrew a gram-negative bacillus (*B. coli*?). The liquor amnii of two other patients was cultured by a modification of Harris and Brown's method,⁵⁰ per vaginam, and yielded an anhemolytic streptococcus in the case where the cord

blood culture was lost. From the other patient, strains of streptococci and *B. coli* identical with those from the cord blood were recovered from the amniotic waters.

The inflammatory changes in the placentas were essentially like those described respectively by Slemmons and Ikeda. The characteristic picture, when well developed, consists in an intra- and subchorionic barrier of leucocytic infiltration (Fig. 1). These leucocytes appear to migrate from all the superficially placed fetal blood vessels, and their destination appears to be the amniotic cavity. Where the chorionic surface is thin, the leucocytes are apparently coming from the



Fig. 1.—A low power photograph of the placenta showing an inflammatory reaction. The section is cut through a large chorionic blood vessel in the vicinity of the umbilical cord. Leucocytes are seen in very large numbers in the chorion between the vessel and the amnion forming heavy clusters, and are seen in the photomicrograph as a wavy black line. They are also seen between the muscle fibers of the blood vessel on its amniotic side.

intervillous spaces (Fig. 2). It is evident that there is a positive chemotaxis which invariably draws the leucocytes toward the fetal cavity. The degree of reaction is proportionate to the degree of chemotactic penetration.

The concept of attraction of leucocytes to amniotic cavity is well illustrated in sections through the umbilical cord of the placentas with marked reaction. Here the leucocytes appear to elect, but more properly by attraction migrate through, that side of the vessel that is

nearer to the amniotic cavity. Thus the direction of leucocytic migration in each vessel differs, and the wandering cells are seen between the muscle fibers and in the surrounding loose Wharton jelly of the cord nearest to the amniotic cavity. (Fig. 3.)

The mildest form of placental inflammation shows an accumulation of leucocytes about the endothelial lining of superficial chorionic blood vessels (Fig. 4). This is usually seen on the side facing the amniotic surface. During this stage very few of the cells were seen between the muscle fibers of the blood vessels migrating to the amniotic cavity. In



Fig. 2.—Low power section through an inflamed placenta showing the intervillous spaces closer to the amniotic cavity near the upper left corner, and further to the right the chorionic membrane, containing a blood vessel, becomes correspondingly increased in thickness. The wavy and irregular-sized dark band at the junction of the intervillous spaces and chorion is the Langhans' fibrinoid strata. Where the intervening chorionic membrane is thinner, the latter is packed with leucocytes apparently from the intervillous spaces. Leucocytes are also seen in the chorionic blood vessel wall in its amniotic aspect and in the chorion closer to the fetal cavity. (Note: The amniotic membrane has become separated and does not show in this photomicrograph.)

the most severe inflammatory reactions there is an apparent stasis of the blood in both the chorionic vessels, and the superficial portions of the intervillous spaces where the intervening chorionic plate is thin. The leucocytes are seen in very large numbers, and they appear to come from both these sources and to spread out under the amnion and chorion.

The maternal surface of the placenta, on the other hand, is little or not at all involved, but here and there in the more severe grades of placental reaction and closer to the periphery gatherings of leucocytes are not uncommonly seen. Here the decidua basalis is closer to the amniotic cavity and, therefore, more liable to chemotactic influence than certain portions of the placenta further from the periphery and separated by a greater thickness of the placenta. There is a diffuse subchorionic barrier of leucocytes in the reflecting membranes. The cells are seen in greatest numbers at the junction of the decidua re-



Fig. 3.—Section through the umbilical cord. The tissues surrounding the blood vessels appear edematous. Leucocytes may be seen within the blood vessel wall and in the loose Wharton jelly adjacent to it only on the sides facing the amniotic cavity.

flexa and chorion laeve (Fig. 5). These wandering cells appear to come from the small maternal vessels in the decidua.

When bacteria are present, they are usually limited to the amnion and chorion of the placenta and its reflecting membranes (Fig. 6). In one placenta in which the bacteria appear in great numbers, there is a tendency on the part of the microorganisms to penetrate a little of the chorion, but they do not encroach sufficiently to suggest an invasion of the maternal spaces. However, the superficial nature of the fetal blood vessels crossing the placenta suggests a very vulnerable point for invasion of the fetal blood stream.

To summarize the picture of placentitis, leucocytes are usually only seen in greatest numbers near the cavity occupied by the amniotic waters. These leucocytes apparently originate from two sources, the fetal and the maternal blood streams. From the former they migrate from the superficially placed chorionic blood vessels toward the amniotic cavity. Leucocytes are seen in greatest numbers in the vicinity of these blood vessels where they may be found between the muscle fibers and in the adjacent placental tissue, and they spread out under the overlying chorionic and amniotic surfaces. From the maternal blood

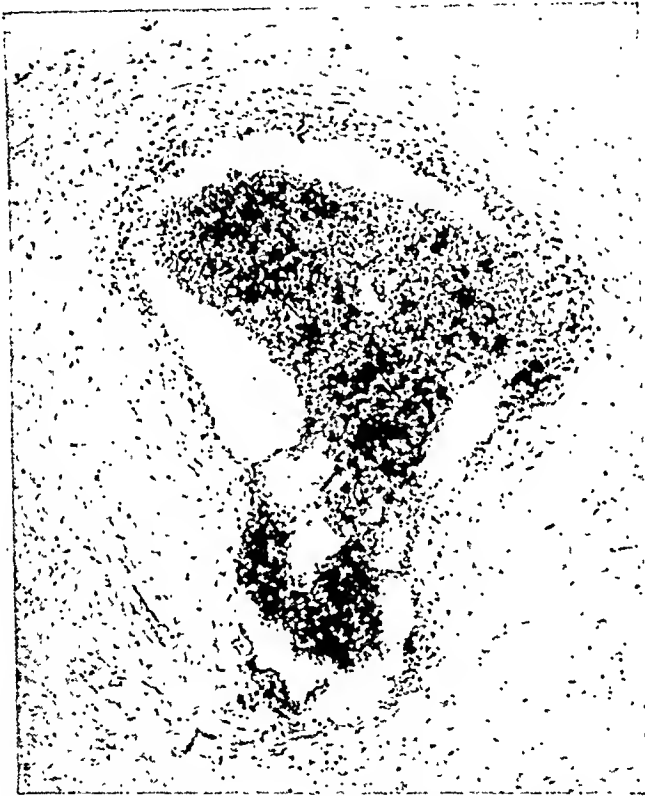


Fig. 4.—Early placental reaction. Section taken through a small chorionic blood vessel showing the leucocytes clustering to the endothelium on its amniotic aspect.

stream the leucocytes originate from the outer villous spaces where the overlying wall of chorion and amnion is thin, and from the decidua at the periphery of the placenta and the reflecting membranes where the relationships to the amniotic cavity are likewise closer.

THE FETUS

Four babies died; one spontaneously in utero, two after instrumental interference, and one fetus was nonviable (a five and half months' pregnancy). The cord blood cultures of all were positive, and their placentas show diffuse inflammatory changes. The placenta of the

baby which died spontaneously contains numerous short chain streptococci on its fetal side. The cord and heart blood of this fetus yielded anhemolytic streptococci. Cultures from the cord and heart blood of the other three fetuses yielded identical strains of streptococci in two cases, and similar strains of diphtheroids in the third case (the five and a half months' fetus).

The necropsy findings of the four dead babies are of special interest. Indicated obstetric interference for the completion of delivery in two of the three full-term fetuses is believed to be the real cause of their deaths. The viscera of these two babies show marked passive conges-



Fig. 5.—Section through the reflecting membranes of the placenta. Numerous leucocytes are seen in the remains of the decidua reflexa where it joins the chorion laeve. There are few leucocytes scattered through the chorion. The loosely attached amnion has become separated from the chorion, and to the right are the remains of an old fixing villus.

tion. One of the babies who lived only thirteen hours had marked intracranial and moderate bilateral adrenal hemorrhages, and only partial lung expansion. The other baby had a large subcapsular hematoma of the liver. The brain was not examined because this fetus was delivered by craniotomy after the heart tones had disappeared during an attempted extraction with forceps. The fetus which died spontaneously in utero showed degenerative changes in all the viscera and numerous small abscesses in the gums. A smear from these abscesses showed many streptococci.

THE MOTHER

An attempt was made to verify the findings of Warnekros, who showed that during the course of intrapartum fever, the mother's blood becomes positive. Four maternal cultures were taken during labor, of which one was positive, revealing an organism identical with that isolated from the cord blood. Conclusions cannot be drawn from this one case, but it indicates that this investigator was probably correct in his findings of a maternal bacteremia in the course of an intrapartum fever.



Fig. 6.—Section through the amnion and chorion (1200 diameters). Notice the short chain streptococci penetrating the amnion and chorion a short distance. This section was taken close to a large underlying chorionic blood vessel, which does not show due to the necessary high magnification. (Macallum stain for bacteria.)

Puerperal sepsis was present in only two of the thirty-nine women with positive blood cultures. Difficult forceps operations were necessary in both cases to complete the delivery. The sepsis was severe in one case in which forceps plus craniotomy was necessary. Two other patients had a temperature elevation of 104° to 105° F. immediately after labor, but they soon approximated the normal level for the remainder of their puerperium. In all the four cases cited the placenta showed a marked reaction. The one patient with an intrapartum fever, whose blood culture was positive at the completion of labor, had an uneventful puerperium.

RELATIONSHIP OF PREMATURE RUPTURE OF THE MEMBRANES TO
INTRAUTERINE INFECTION

A tabulation of the time interval between rupture of the membranes and the birth of the child indicates that significant increase in the incidence of intrauterine infection takes place as this time increases. (See Table I.) Of the total series studied the time of rupture was accurately ascertained in only 331 cases, of which 68 were more than two hours. The latter group includes twenty of the positive cord blood cases, four cases in which the placentas were inflamed, although the

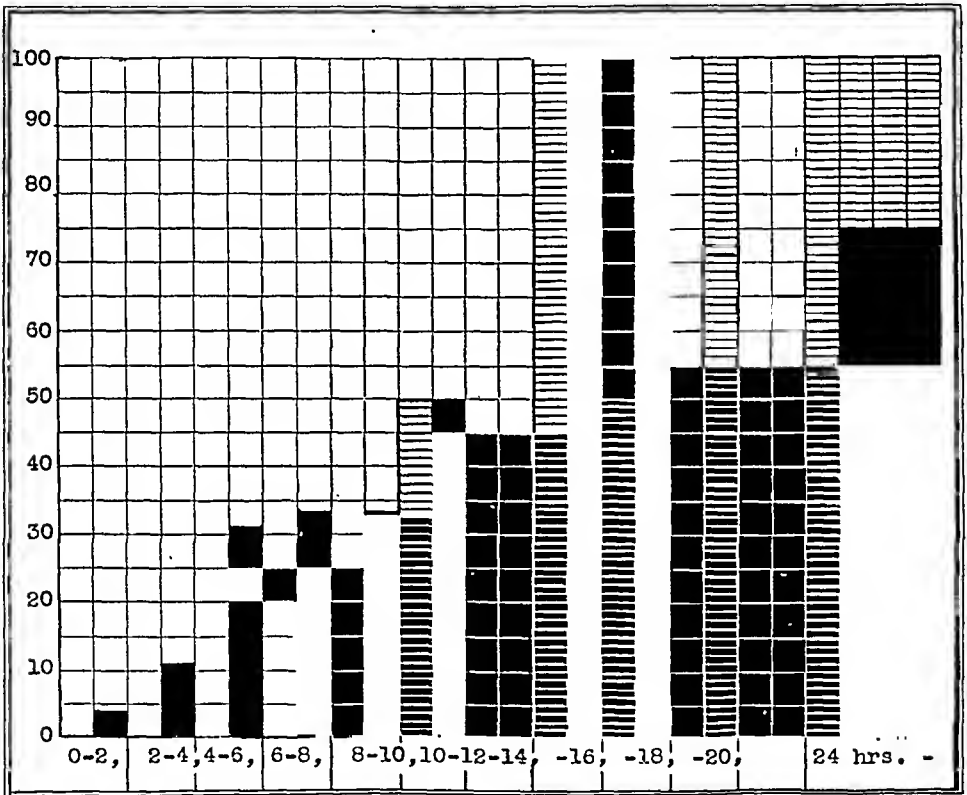


Fig. 7.—Relationship of prolonged rupture of membranes to the percentage of positive cord blood cultures and the incidence of placental inflammation. (Note: Abscissas represent hours of ruptured membranes. Ordinates represent percentage of positive fetal blood cultures. Solid bars, positive cord blood cultures. Striped bars, placental reactions.)

cord blood was negative, and one case where the membranes had ruptured over twenty-four hours, and the baby with a negative cord blood culture developed a pemphigoid lesion shortly after birth. No histologic study was made of the placenta of this case. Potential intrauterine fetal infection is assumed to have been present when either the cord blood or amniotic fluid culture was positive, an intrapartum fever unaccountable from any other source was present, when the placenta showed a cellular reaction, or when the baby had evidences of infection noted at birth or shortly afterward. The percentage of infections

TABLE I. RELATIONSHIP OF RUPTURE OF MEMBRANES TO THE PRESENCE OF BACTERIA IN THE FETAL CIRCULATION, INFECTION OF BABY OR MOTHER, AND TO THE INCIDENCE OF PLACENTITIS

HOURS RUPTURED	NO. OF CASES	CORD BLOOD CULTURE	PLACENTAS	BABY	MOTHER		PERCENTAGE OF INFECTION	
					INTRAPARTUM	PUERPERIUM	CORD BLOOD	PLACENTA
0 to 2	303	14	Negative	All normal	Afebrile	1 case of pyelitis. Cord blood. Culture positive. B. fecal. alkalig.	4.1	0
2 to 4	27	3	Negative	Pneumococcus conjunctivitis (1 case) blood culture. Pneumococcus gr. 2	Afebrile chronic otorrhea	Ch. otorrhea. Smear: pneumococci not isolated in culture.	11.1	0
4 to 6	19	6	Negative	Pemphigus lesion. Staph. aureus from skin and blood identical (1 case)	Afebrile	All normal	31.6	0
6 to 8	3	1	Negative	Staph. albus pustules (1 case) negative cord blood culture	Afebrile	All normal	33.3	0
8 to 10	3	1	Negative	All normal	Afebrile	All normal	33.3	0
10 to 12	2	1	Definite reaction. Cord blood cult. neg. (1 case)	All normal	Slight fever. (Case with placental reaction)	Low grade fever 2 days	50.0	50
12 to 14	2	Negative	Not examined	All normal	Afebrile	All normal	0.0	0
14 to 16	1	1	Definite reaction	Nonviable, cultures from heart and cord blood: diphtheroids	Moderate fever	105 after third stage. Low fever 4 days	100.0	100
16 to 18	2	1**	Definite reaction. Culture contaminated	All normal	Afebrile	All normal	100.0	50
18 to 20	1	Negative	Marked reaction. Purulent amniotic waters (B. coli)	Normal	Low grade fever. Cesarean section	Uneventful	0.0	100
24 or more	9	6 (1 culture lost)	Marked reaction 8 cases. (1 placenta not studied)	1 died spontaneously. Streptococci in heart blood, cord blood, placenta. 2 died following instrumental deliveries. Pemphigus neonatorum (1 case)	Low grade fever (8 cases)	Marked sepsis (1 case), low grade sepsis (1 case), chills after delivery (2 cases), maternal bacteremia (1 case)	75.0	100

increased proportionately as the period between rupture of the membranes and the birth of the baby becomes prolonged, infection was always present in this series when the membranes had ruptured sixteen hours or more. (See Fig. 7.)

COMMENT

Bacteria are normally present in the vagina or introduced manually by examination or instrumentation. During the normal course of labor with a relatively short second stage period and with the head favorably engaged in the pelvis, these organisms, as a rule, prove to be harmless.

On the other hand, should the membranes rupture prematurely with the head high and floating, the existing organisms, or those introduced manually, readily find their way into the amniotic cavity. If a sufficient period of time is allowed for these bacteria to flourish in this favorable medium, they elaborate a toxin capable of attracting the leucocytes wherever the toxic effects may penetrate. The placental circulation appears to be retarded, and there is a margination of the leucocytes in the chorionic blood vessels which is limited to the fetal aspect of the blood vessel. If the chorionic membrane is thin, or the chemotactic power sufficiently strong, leucocytes are called forth even from the intervillous spaces. This leads to the well-known picture of placental reaction or inflammation, and purulent amniotic waters may thus be formed. It is purely a picture of the effects of chemotaxis and is independent of any factor of nerve irritability since Schmitt⁵¹ and Ikeda have shown that the placenta is devoid of any nervous regulation.

When the picture of placental reaction has developed, the organism usually has entered the fetal circulation. The large superficial vessels crossing the placenta suggest a ready mode of entrance. During the course of intrapartum temperature a positive maternal culture was obtained once in four cases. Warnekros, who first pointed out the possibility of maternal infection and sepsis developing through this route, obtained positive cultures in eighteen out of twenty-five cases. He believed that the culture was best taken either immediately after the pain that follows a chill, or at the completion of the second stage of labor. The bacteremia in the mother was temporary and usually harmless. The fetal bacteremias reported here were, for the most part, harmless to the baby. The pathogenicity is determined by such factors as length of labor, the mode of delivery of the baby with its associated trauma, and by the virulence of the organism in the fetal circulation.

Apparently the organism may effect its entrance in the fetal blood stream before the placenta shows any changes. Thirty of the thirty-seven positive cord blood cultures showed no corresponding placental changes. All the babies lived and only two showed morbid bacterial processes. Walser, Traugott, Santi,⁵² and Magid report cases of trans-

placental fetal diseases with the absence of any placental reaction. Apparently microorganisms, harbored by the mother as foci of infection or as outspoken clinical diseases, may pass through the placenta without causing any histologic changes in this fetal organ. Lubarsch, who studied the transmission of pathogenic bacteria in pregnant animals, finds that some placentas disclose pathologic changes such as hemorrhages and necrobiosis about the villi, while others, after exhaustive studies, have no characteristic changes, although their corresponding fetuses show the presence of bacteria in many of their organs. Walser recently cites two cases in which *Streptococcus viridans* caused bacterial endocarditis in the mother and was transmitted through the placenta. One fetus died of a streptococcus infection, and the other was clinically normal even though the cord blood culture at birth and a subsequent one from the baby were positive for *Streptococcus viridans*.

The following case illustrates a possible fetal infection transmitted from a maternal focus:

N. Z., para ii, was spontaneously delivered after a labor of ten hours and thirty-three minutes, and ruptured membranes of three hours. The cord blood culture yielded a pneumococcus of Group II. The baby developed a pneumococcus conjunctivitis on the seventh day. The mother had had a long standing discharging right ear which yielded an organism having the morphologic characteristics of a pneumococcus but which could not be isolated because it was always overgrown by Friedlander's bacillus.

A frequent source of fetal bacteremia may be ascribed to the vaginal flora ascending into the amniotic cavity when the membranes have been ruptured for a long period of time. The bag of waters, however, is not an essential barrier to microbial invasion from the vagina. Harris considers the uterine cavity to be invariably infected after six hours of labor regardless of the status of the fetal membranes.

The following case is offered as an example of intrauterine fetal infection per vaginam.

R., para vi, was delivered spontaneously after a period of labor less than three hours but with membranes ruptured six hours prior to delivery. The cord blood culture yielded a hemolytic *Staphylococcus aureus*. Shortly after birth a raw area covering the entire dorsal aspect of the left hand was noticed. Similar lesions on the right ear, the neck, the buttocks and both feet and legs were seen on the second day. These lesions developed into large vesicles and were diagnosed as pemphigus neonatorum. The baby was placed in strict isolation and discharged from the hospital on the sixth day because of the contagious character of the disease. The skin lesion was still present when the baby was seen one year later. The mother presented no foci of infection, and there were no other pemphigoid skin lesions in the nursery prior to or immediately subsequent to this case.

The organisms recovered from the cord blood and the skin lesions were identical and were similar to the one described by Falls⁵³ in 1918. The following bacteriologic characteristics were observed in the staphylococci recovered from the cord blood and skin lesions: litmus milk was acidified; a golden pigment formed on potato

medium; a proteolytic action on gelatin; and acid without gas formation in Russle's medium. Ujj⁵⁴ reports three babies with lesions similar to these described. The lesions were noted at birth, and babies were all from the same mother, and the disease is believed to have been contracted in utero.

A review of the thirty cases of positive cord blood cultures where the placentas were histologically negative, shows that in 50 per cent of these there was a prolonged rupture of the bag of waters. On the other hand, in all the remaining cases with no evidences of infection, the rupture was prolonged in only about 9 per cent of the cases. A comparative study of these percentages indicates that in the positive culture series prolonged rupture of membranes is a factor about five and one-half times as frequent. These facts plus conclusions that can be drawn from a study of Table I and graph (Fig. 7) seem to indicate that the organisms present in the vagina find their way more readily into the amniotic cavity after rupture of the bag of waters.

Apparently the organisms may penetrate the placenta through the epithelium and enter to the fetal circulation. Slemons stated that in prolonged rupture of the bag of waters the escape of fluids reduces the size of the amniotic cavity and the uterus retracts. The amniotic epithelium and its basic attachment then become distorted and the cells injured, killed or impaired in their protective activity. Bacteria present are then more likely to pass through the subamniotic connective tissue and enter the efferent fetal vessels which cross the placenta. The organisms present in the liquor amnii for a relatively short period before birth have not had time to elaborate a chemotactic toxin which may excite a placental reaction. If the organisms are nonpathogenic, as they frequently are, the bacteremia is a temporary and harmless condition in both baby and mother.

Ikeda seems skeptical concerning the placental reaction as an evidence of infection. Nevertheless, scrutinizing his work, it is noted that the time element in the rupture of the bag of waters is not given and that the period of labor was the only factor he studied. It is to be noted that some of the patients in his series had a short labor, and yet the placentas show a marked cellular reaction. In a separate study of a small series of dry labors, we noted three placentas having diffuse reactions, although they were obtained from patients with short labors, however, the membranes in each case had ruptured for a long period before the onset of labor. We feel, therefore, that in neglecting to take into consideration the period of rupture of the bag of waters, Ikeda had overlooked an important factor which may be interpreted as favoring infection.

If the organism is potentially pathogenic, the baby or mother may be expected to be affected. This is exemplified in the one baby that died spontaneously in utero and the organisms were recovered in the fetal organs, and in the placenta. If the mother's tissues are damaged

by obstetric procedures, pathogenic organisms may lodge, flourish and extend through the uterus and parametrium and may evoke a generalized sepsis. In the series in which the placentas show marked reaction, in only the two cases where surgical intervention was strenuous did the mother show puerperal sepsis. Indeed, additional factors play a part, such as exhaustion and diminished resistance after a prolonged labor. We do not presume to advance the etiology of all puerperal infections. An attempt is made to indicate one potent way in which sepsis may arise during the puerperium.

The baby bathing in an infected medium can likewise be infected by routes other than the blood stream, and Noake believes that some skin infections can arise this way. During the course of a prolonged difficult labor the baby may show effects in other ways. The fetus may prematurely aspirate when disturbed. Thus, Hook, Browne, Dodds and other writers have indicated that prolonged rupture of bag of waters may be a factor in neonatal pulmonary infections. The organisms may also be swallowed and gastrointestinal complications may subsequently develop. Aschoff has also reported that the organism taking the route via the eustachian tube can cause an infection of the middle ear of the fetus.

SUMMARY AND CONCLUSIONS

The 374 consecutive fetal blood cultures, aseptically drawn from the umbilical cord during the third stage of labor, were routinely studied. Thirty-four, or approximately 9 per cent, were positive. Histologic studies were made of placentas in all instances in which the cord blood culture was positive or the labor unduly prolonged. Morbid processes in all babies were studied histologically and bacteriologically.

It was shown that the fetus may have a temporary bacteremia without any untoward effects. The bacteremia occurs in the fetus frequently as an ascending infection after a prolonged rupture of the bag of waters. The infection route is through vagina, liquor amnii and then transplacental. The maternal blood stream can likewise transmit diseases or foci of infection to the fetus transplacentally.

Placental reaction is the result of a prolonged sojourn of organisms in the liquor amnii, and the elaboration of a toxin having chemotactic properties. Leucocytes in the fetal vessels and possibly in the maternal intervillous spaces are then attracted toward the amniotic cavity.

The organisms in the amniotic fluid break through the damaged amniotic epithelium and through the superficially coursing placental vessels, and thus enter the fetal circulation causing a bacteremia. The prognosis for the fetus becomes unfavorable as the period between rupture of the membranes and the birth of the fetus becomes unduly prolonged.

I wish to acknowledge the supervision of this work by Dr. Oscar T. Schultz, the valuable suggestions by Dr. Katherine M. Howell, and the clinical cooperation by Dr. Joseph L. Baer; without their help this work could not have been completed.

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(For discussion, see page 428.)

THE PHYSIOLOGY OF THE UTERUS IN LABOR*

AN EXPERIMENTAL STUDY OF THE DOG AND RABBIT

BY LOUIS RUDOLPH, M.D., AND A. C. IVY, PH.D., M.D., CHICAGO, ILL.

(From the Department of Physiology, Northwestern University Medical School)

THE progress in obstetrics in recent years has demonstrated that many complications which occur during pregnancy and labor can be reduced to a minimum by proper prenatal supervision. "Uterine inertia" is an outstanding problem which still confronts us. Blair Bell¹ and Cragin² have stated that an effort should be made to determine its cause and treatment before the onset of labor. At present it is impossible to prognosticate whether a patient will or will not have "uterine inertia" in her coming labor. Our investigation was undertaken with the hope that certain facts might be discovered and correlated which might have a bearing on, and stimulate the obstetrician to find a solution of this question.

We have attacked the problem experimentally in animals, because we believe that a thorough understanding of the mechanism of labor and the factors that control the activity of the uterine musculature in higher mammals will contribute much to an understanding of these phenomena in man. Our studies up to the present have been confined to the dog and rabbit. In this paper we will report the findings on, first, the mechanism of labor in the dog studied under direct vision; second, the effect of stimulation and section of the extrinsic nerves of the uterus in the rabbit and the dog; third, the effect of certain drugs on the uterus in situ by the use of a method which graphically records uterine motility; fourth, the experimental rupture of the uterus in the dog.

Nonpregnant Uterus of the Dog.—The uterus of the dog is bicornuate. It is made up structurally of the cornua uteri, fundus uteri, corpus uteri, cervix uteri, and the fallopian tubes and is an abdominal organ.^{3, 4, 5, 6}

The cornua uteri are two long, tubular horns measuring 12 to 15 cm. in length in a medium sized dog. They diverge from the fundus uteri in the form of a "V" toward the kidneys. The fundus uteri is a narrow portion situated between the cornua and the corpus uteri. The corpus uteri is short, measuring about 2 to 3 cm. in length, and is situated in the midline of the lower abdominal cavity. It passes downward, and at the junction of the abdominal and pelvic cavities there is a slight narrowing which marks the site of the cervix uteri. The cervix uteri is very short and is made up of the internal os, cervical canal, and the external os. The musculature consists of three layers, a thin external layer of longitudinal fibers, a thick inner layer of circular fibers, and a middle layer, which is made up of

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vascular and connective tissue, and circular and oblique muscular fibers. The nerve supply is from the hypogastric plexus and the N. pelvici.

Nonpregnant Uterus of the Rabbit.—The uterus of the rabbit is a "uterus duplex." Each uterus is complete, having a corpus uteri and a cervix uteri. The corpus uteri is a thick tube which tapers upward to receive the fallopian tube at its uppermost part. As it enters the vagina a slight narrowing is seen, which marks the location of the cervix uteri. The cervix uteri consists of an internal os, a cervical canal, and an external os. The two cervixes open into the vagina in the midline of the abdominal cavity, but are separated by the septum of the vaginal vault. The upper third of the vagina in the rabbit is in the lower abdominal cavity.

The musculature consists of three layers, a thin external layer of longitudinal fibers, a thick internal layer of circular fibers, and a middle layer of vascular and connective tissue and circular and longitudinal muscle fibers. The nerve supply is from the hypogastric plexus and the N. pelvici.

The Mechanism of the Uterus in Labor in the Dog.—At term: On opening the abdomen the gravid uterus lies on the ventral abdominal wall and extends upward to the stomach and liver. The cornua uteri measure 30 to 50 cm. long in a dog of medium size. The cornua are divided into segments, each containing one fetus, called the ampulla. Above and below the ampullae are seen the constriction zones. The short corpus uteri is empty.

Just prior to the onset of labor the corpus uteri is found to be increased in size, empty, but not dilated. It is definitely demarcated from the horns by a circular constriction at the orifice of the horns and from the vagina by a circular constriction, just external to the cervix uteri. The circular constriction at the orifice of the horns suggests the presence of a physiologic sphincter to which we will refer later. The horns are relatively quiet, only an occasional mild peristalsis is observed.

Labor.—The method used to study the activity of the uterus in labor, was as follows: On going into labor the abdomen was opened under light ether anesthesia in a warm room. The uterus was kept moist and warm by applying normal saline solution (39° C.) and by covering it with towels wet with warm saline solution. It was found to be unnecessary to use the abdominal window method, ⁸ employed in the rabbit, it being practically impossible to use such a method in the dog.

On the basis of our observations we divide labor in the dog into three stages: (1) stage of cornual expulsion, (2) the stage of uterine expulsion, and (3) the stage of placental expulsion.

On opening the abdomen of the dog in labor, a portion of the advancing fetus is usually found in the corpus uteri, which is partially dilated by the presenting part. The ampulla from which the fetus is passing is actively contracting. (Fig. 1, 2.) The remainder of the horn and the opposite horn are relatively inactive, only an occasional peristalsis being observed. Relatively mild peristalses pass over the active ampulla at intervals of from two to five minutes. The fetus is advanced by a circular or a cylindrical band of contraction which begins at the constriction zone and spreads downward over a portion of the ampulla, the fetus advancing before it. (Fig. 1, 3.) These appear and disappear at less frequent intervals than the peristalses. A longitudinal contraction or shortening occurs usually with each circular band of contraction. This longitudinal shortening persists. This is known as an "isometric contraction" to physiologists and is probably analogous to the term "retraction" used by the obstetrician. This type of longitudinal contraction or shortening prevents the fetus from returning to its former position and renders it possible for the subsequent peristalses, through the relatively mild force they exert, to play a rôle in further dilating the corpus uteri. *In other words, the fetus is advanced by a strong cylindrical band of circular*

contraction that spreads downward and by a longitudinal shortening. The retreat of the fetus is prevented by a persistent longitudinal contraction or "retraction." The evacuation of the fetus from the ampulla is analogous to the evacuation of the colon in the dog in every respect except that it occurs at a slower rate.

The corpus uteri, which just prior to labor was only about 3 or 4 cm. in length, is increased gradually in all diameters by the advancing fetus until it measures approximately 10 by 6 cm. This increase in size is due to thinning of its walls and stretching of its musculature. We have no evidence to prove that the increase in the length of its musculature is due to a local nervous inhibition or mechanical stress. (This will be discussed later.)

When the fetus has been entirely expelled from the horn, a portion of its presenting part is in the vagina (Fig. 1, 4). We have not observed how the cervix is first obliterated and the uterovaginal canal is formed. It probably occurs in a manner similar to that concerned in the dilatation of the corpus uteri.

After the fetus has been passed from the horn, the ampulla becomes inactive except for mild peristalsis. The circular muscle relaxes, but not completely. The longitudinal muscle relaxes, but not completely. The ampulla is now approximately one-half its former size. The placenta is still in place. The ampulla remains in this state until the fetus has been expelled from the corpus uteri.

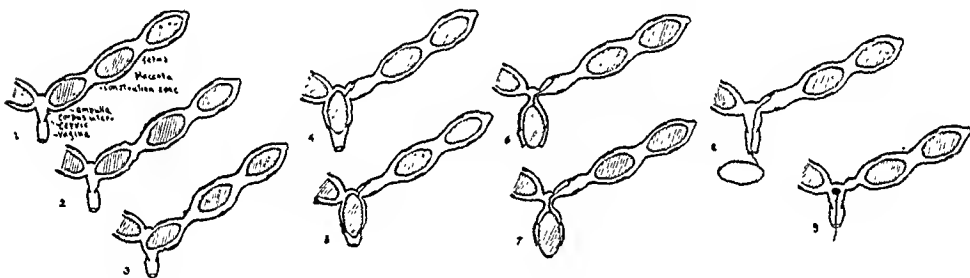


Fig. 1.—Diagram showing various stages of uterine activity in the process of labor.

The Stage of Uterine Expulsion.—In our experience this stage begins within one to five minutes after the fetus has been expelled from the horn. This stage is initiated by a simultaneous contraction of the fundal sphincters or orifices of the horn (Fig. 1, 5), and a transverse circular contraction of the vault of the corpus uteri (Fig. 1, 6). The transverse circular contraction, with some longitudinal shortening, moves slowly toward the vagina, until the entire corpus uteri is contracted firmly (Fig. 1, 7). This advances the fetus into the vagina. At this time the abdominal muscles and diaphragm contract, resulting in a bearing down movement. One dog was observed to "grunt" during this bearing down movement. The vagina, also, contracts and causes the final expulsion of the fetus.

After expulsion of the fetus, the corpus uteri decreases in size, but does not return to its original size, and is gradually distended again as the next fetus enters it.

The Stage of Placental Expulsion.—Within one to five minutes after the fetus is born, the ampulla from which the fetus has come, undergoes a marked longitudinal shortening with some circular contraction. This movement apparently separates the placenta, because it can be easily extracted following this movement, which is otherwise not the case. This longitudinal shortening is so great that the ampulla which originally measured approximately 14 to 15 cm. in length, now measures only 4 to 5 cm. in length. This brings the adjacent ampulla, or fetus, within a short distance of the orifice of the horn and holds it there, because the contraction of the longitudinal muscle persists (Fig. 1, 8 and 9).

FURTHER OBSERVATIONS

Soon after the separation of the placenta, activity usually begins in the lowermost ampulla of the opposite horn, and the fetus in it is expelled. However, in one case, two fetuses were passed from one horn, before one was passed from the other horn.

A very remarkable process to observe is the passage of the fetus through the contracted ampulla from which the preceding fetus and placenta have been expelled. The advancing fetus circularly distends the retracted ampulla, but its contracted longitudinal musculature does not relax. This leads to an apparent fusion of the emptied ampulla with the ampulla above which is in the process of being emptied. A wave of circular contraction can pass over the active ampulla onto the emptied ampulla without any apparent change in its longitudinal musculature.

The above-described process continues until the uterus is evacuated. The horns, which at the onset of labor measured approximately from 30 to 50 cm. in length and from 9 to 11 cm. in diameter, now measure from 13 to 17 cm. in length and from 4 to 6 cm. in diameter.

We have not observed antiperistalsis in the uterus of the dog, which has been seen to occur by Ludwig and Lenz⁷ and by Wijsenbeek and Grevenstuk⁸ in the pregnant uterus of the rabbit. We have seen antiperistalsis in the pregnant and nonpregnant uterus of the rabbit, but they do not occur frequently.

The Effect of Nerve Stimulation on the Uterus of the Rabbit.—Langley and Anderson⁹ found that stimulation of the sympathetic in the region of the second, third, and fourth lumbar nerves in cats and rabbits causes pallor and contraction of the tubes, uterus, and vagina. Cushny¹⁰ found that stimulation of the hypogastric nerve in the rabbit causes contraction whether pregnant or not. Fellner¹¹ made observations that led him to believe that the hypogastric is motor to the circular fibers of the corpus uteri and longitudinal fibers of the cervix, and is inhibitory to the longitudinal fibers of the corpus and the circular fibers of the corpus uteri, and that the nerve erigens is motor to the longitudinal fibers of the corpus uteri and the circular fibers of the cervix. Whitchose and Featherstone¹² concluded that the sympathetic is motor to the circular fibers and inhibitory to the longitudinal, and that the lumbar cord is motor to the longitudinal fibers and inhibitory to the circular. Paralysis of the lumbar cord in rabbits and man according to them causes marked contraction of the circular fibers.

Our Results on Rabbits.—On opening the abdomen under light ether anesthesia and in a warm saline bath, the nonpregnant uteri manifested peristaltic activity, the movements passing toward the vagina usually, and rarely toward the ovaries. The pregnant uteri manifested very little spontaneous peristaltic activity, the rabbits being pregnant more than two weeks. The movements that occur are feeble and are confined chiefly to the constriction zones between the ampulla. The two horns do not show synchronous activity. These observations are in agreement with the abdominal window observations of Ludwig and Lenz⁷ and Wijsenbeek and Grevenstuk.⁸

All stimulations were repeated two or three times.

NONPREGNANT RABBITS

Stimulation of the Hypogastric: In four out of five rabbits circular contraction occurred on stimulation of the hypogastric nerve. Slight longitudinal shortening occurred in one. Stimulation of the lumbar chain caused longitudinal shortening in all five rabbits. Definite circular contractions, also, occurred in two of the five.

Stimulation of the Hypogastric Plexus at the Bifurcation of the Aorta.—Stimulation of the hypogastric plexus at the bifurcation of the aorta caused constantly a marked blanching and contraction of both uteri to such a degree that the uterus coiled on itself and assumed the position of a "ram's horn." The vagina contracted markedly manifesting "tortuous or churning" movements. This result was very striking and constant. After stimulation the uterus relaxed more than normal, became reddened, and relatively quiescent.

Section of the Cord at the Twelfth Thoracic or First Lumbar.—Section of the spinal cord at the level of the twelfth thoracic or first lumbar in three rabbits resulted in circular spasms in one, circular and longitudinal spasms in one, and increased peristalsis in the other. The activity of the uterine was increased, but not in a uniform manner.

PREGNANT RABBITS

Stimulation of the Hypogastric.—The stimulation of the hypogastric nerve was done in four pregnant rabbits. In two, circular and slight longitudinal contractions occurred at the constriction zones between the ampullae. In the other two, no movements were elicited.

Stimulation of the Lumbar Chain.—Stimulation of the lumbar chain resulted chiefly in longitudinal contractions in three of the four rabbits.

Stimulation of the Hypogastric Plexus at the Bifurcation of the Aorta.—Contractions (three rabbits) occurred chiefly at the constriction zone. In one, circular spasm occurred, in one, circular and longitudinal, and in the other, longitudinal. Slight longitudinal contraction of the ampulla opposite the placental site occurred in one rabbit. This was along the course of a longitudinal band of muscle resembling the tenia of the colon. The placental site did not change. Pallor of the uterus occurred, the placental site being least affected.

Section of the Cord at the First Lumbar.—Section of the cord caused increased circular and longitudinal motility of the constriction zone.

Vagina.—The motility of the vagina was increased by all the above procedures, it being chiefly affected by stimulation of the hypogastric plexus at the bifurcation of the aorta.

SUMMARY

The nonpregnant rabbit's uterus manifests spontaneous movements, and an occasional reverse movement is observed. The pregnant uterus is definitely less motile and more refractory to nerve stimulation. The musculature at the placental site was not caused to contract in a single instance. Nerve stimulation increased the motility of the uterus, but not in a uniform manner in respect to the circular and longitudinal musculature. However, hypogastric stimulation results, chiefly, in a circular contraction; stimulation of the lumbar chain results chiefly in a longitudinal shortening; and stimulation of the plexus at the bifurcation of the aorta, uniformly causes a longitudinal and circular contraction with a curling of the uteri. The erigens nerve was not stimulated in the rabbit. Section of the spinal cord at the twelfth thoracic or first lumbar causes increased motility of the uterus in the rabbit.

Observations on a Rabbit Pregnant in One Uterus and Not in the Other.—On opening one rabbit in our series, we found that one uterus contained nine fetuses, which measured approximately 21 mm. in size. On the pregnant side the ovary

contained corpora lutea, and on the nonpregnant side graafian follicles only were present. The nonpregnant uterus was quite motile, but the pregnant uterus manifested an occasional peristalsis. On handling the pregnant uterus the constriction zone manifested longitudinal contraction. Stimulation of the hypogastric resulted in circular and some longitudinal contractions of the nonpregnant uterus, which gave it a "beaded" appearance, and resulted in the pregnant uterus in a longitudinal contraction of the constriction zone. Stimulation of the lumbar chain (third lumbar) resulted in a marked longitudinal contraction of the constriction zone only of the pregnant uterus. Stimulation of the bifurcation at the aorta resulted in a "curling" of the nonpregnant uterus and a marked longitudinal and circular contraction of the constriction zone of the pregnant uterus, the ampullae being only slightly affected. The vagina manifested tortuous movements.

In this animal, we were able to observe the effect of pregnancy on the uterus, having for a control the nonpregnant uterus.

This we believe is a very significant observation, because it demonstrates that the products of conception, especially the placenta, are concerned in the change in the motor activity and muscular changes incident with pregnancy, and is not due

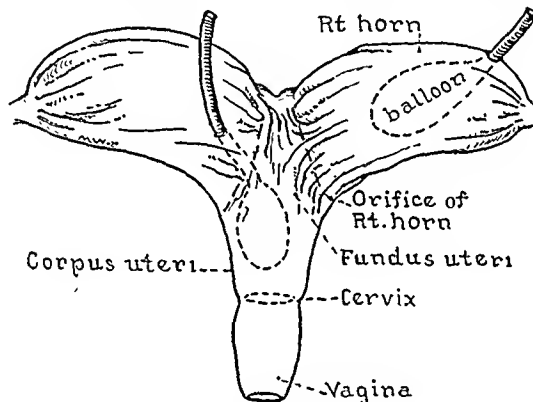


Fig. 2.—Diagram of postpartum uterus of dog with balloons in place for recording movements.

to some extrauterine hormone as has been postulated by Cow¹³ and others. This observation also suggests a new research method for the study of uterine changes, provided this experiment of "Nature" can be reproduced experimentally.

Action of the Drugs on the Uterus of the Rabbit in Situ.—Histamine increases the peristaltic activity of the nonpregnant uterus of the rabbit. Pituitrin causes marked longitudinal and circular contraction of the pregnant uterus throughout with blanching of the placental site. The fetuses remained stationary, however. Epinephrine causes a temporary longitudinal contraction followed by relaxation.

The Effect of Nerve Stimulation and Drugs on the Uterus of the Dog.—Most of our observations on this problem were made by the use of a modification of a method used by Henricius,¹⁴ and Kehler,¹⁵ and Rucker¹⁶ for recording movements of a human uterus in situ. This method involves the use of bitches that have recently whelped, i.e., from six to twenty-four hours after parturition has been completed. In such a uterus the corpus uteri and horns are relatively large and balloons can be inserted into them at any point and the movements recorded on a smoked paper by using a water manometer, the balloons being held in place by a suitable stitch. In most of our experiments a balloon was placed in one horn and in the corpus uteri; in others three balloons were used, one in each horn and one in the corpus uteri (Fig. 2).

General Observations by Use of This Method.—Our tracings show that the postpartum uterus of the dog possesses a definite polarity which is manifested by the fact that in most instances a contraction of the horns precedes by a few seconds a contraction of the corpus uteri (Fig. 4). In 2 of 6 dogs studied, the corpus uteri was observed to relax during the early part of the period of contraction of the horns (Fig. 3). This occurred too uniformly in these dogs to be a coincidence. The two horns move independently of one another.

Effect of Nerve Stimulation on the Motility of the Dog's Uterus.—In these experiments, the hypogastric nerve just cephalad to the hypogastric plexus, the nerve erigens or pelvic nerve, before it bifurcates in the pelvis, and the uterine plexus were stimulated. Up to the present time we have studied 7 postpartum, one pregnant, and one nonpregnant, dogs. The balloon method was used in the postpartum dogs. The results can be briefly summarized as follows: (1) electrical stimulation of these

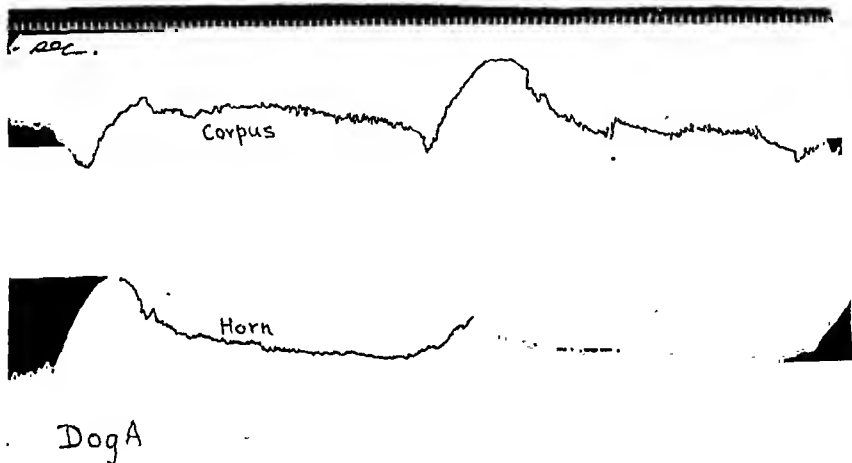


Fig. 3.—A tracing from a dog that had whelped twenty-four hours previously showing a relaxation of the corpus uteri in the early stage of cornual contraction. This was observed to occur in two dogs of our series.

nerves had no detectable effect on the motility of the uterus of the dog (Figs. 4 and 5); (2) in one postpartum dog, bilateral section of the nerve erigens caused an increase in the frequency of the uterine contractions, and excision of the hypogastric plexus caused a temporary (five minutes) inhibition followed by a return to normal rhythm.

These observations confirm the view that the uterus of the dog is primarily an automatic organ and an intrinsic uterine nervous mechanism is chiefly concerned in the control of its muscular activity. If further experiments duplicate the observation on the effects of section of the extrinsic nerves of the dog's uterus, such results will demonstrate that the nerve erigens exercises a tonic inhibitory action and the hypogastric a tonic motor action on the uterus of the dog. Further experiments are necessary to prove the existence of such an innervation.

Effect of Drugs on the Uterus of the Dog in Situ.—Epinephrine: Epinephrine was injected intravenously in doses of $\frac{1}{2}$ to 1 c.c. of a 1:10,000 or 1:20,000 dilu-

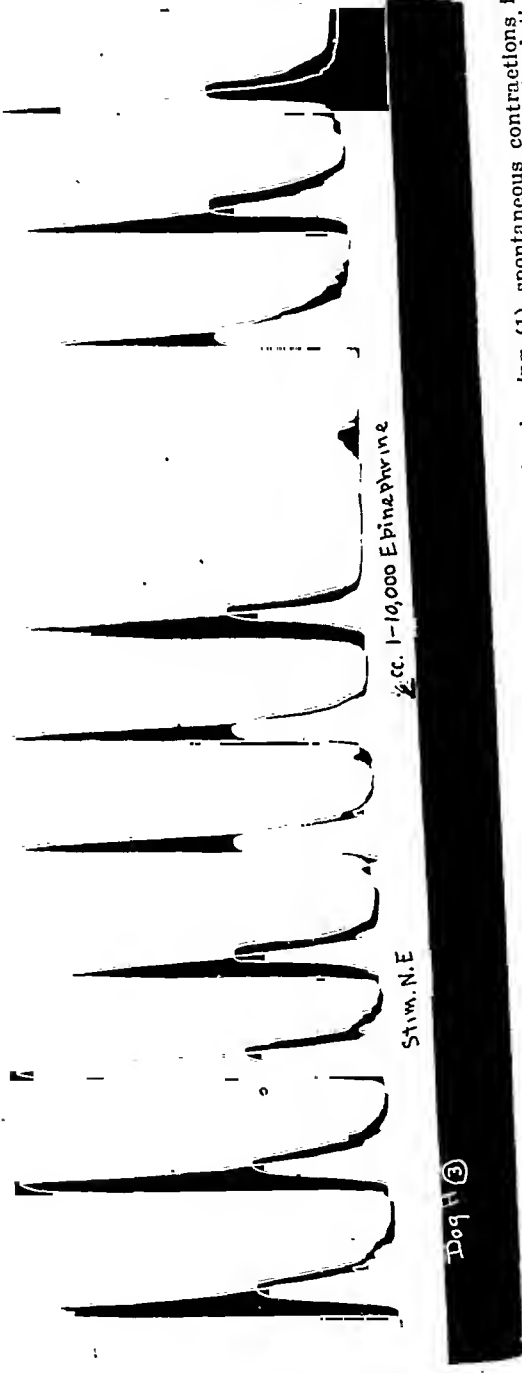


Fig. 4.—A tracing from a dog that had whelped twenty-six hours previously showing (1) spontaneous contractions in which the horn contracted a few seconds (9-18) prior to the contraction of the corpus uteri, (2) the effect of stimulation of the nerve endings, and (3) the effect of epinephrine on the spontaneous contractions of the postpartum uterus in situ.

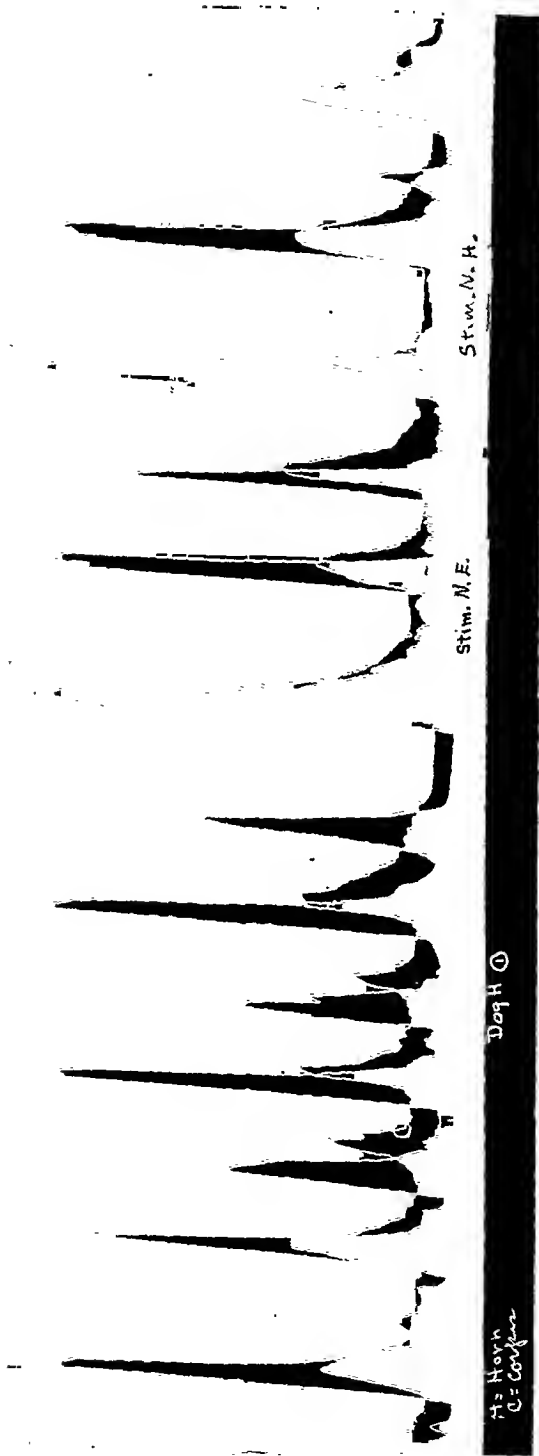


Fig. 5.—A tracing showing no effect on stimulation of the hypogastric nerve and nerve erigens on the spontaneous contractions of the postpartum uterus of the dog.

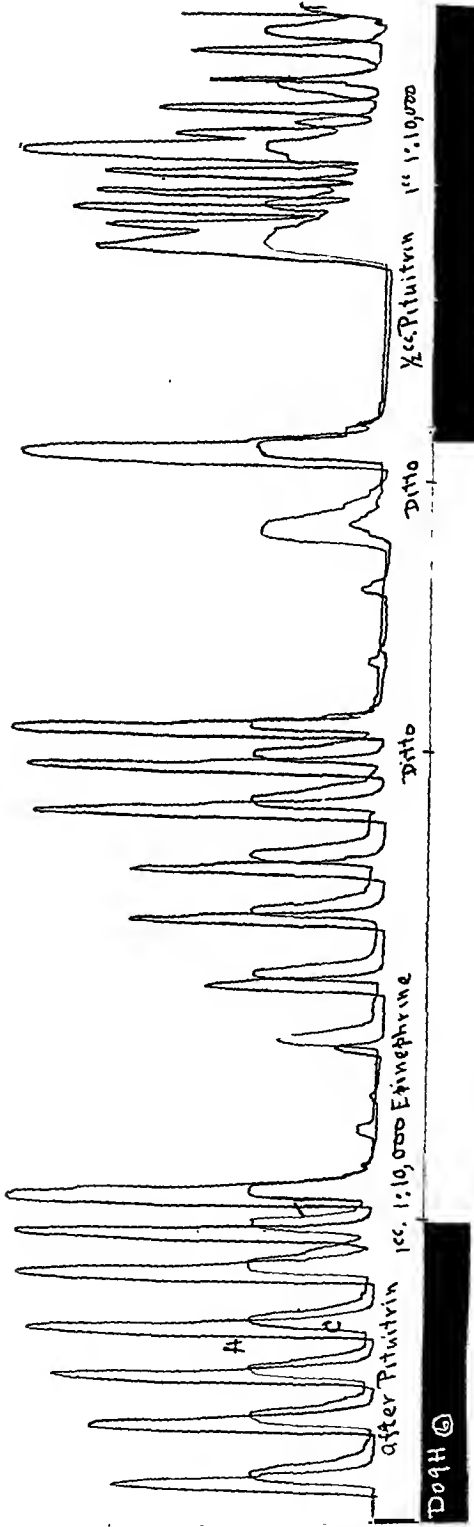


Fig. 6.—A tracing showing the inhibitory effect of epinephrine on the contractions of the uterus caused by pituitrin.



Fig. 7.—A tracing showing (1) very little spontaneous activity of the uterus twenty-four hours postpartum, (2) no effect on stimulation of the hypogastric, and (3) the effect of pituitrin.

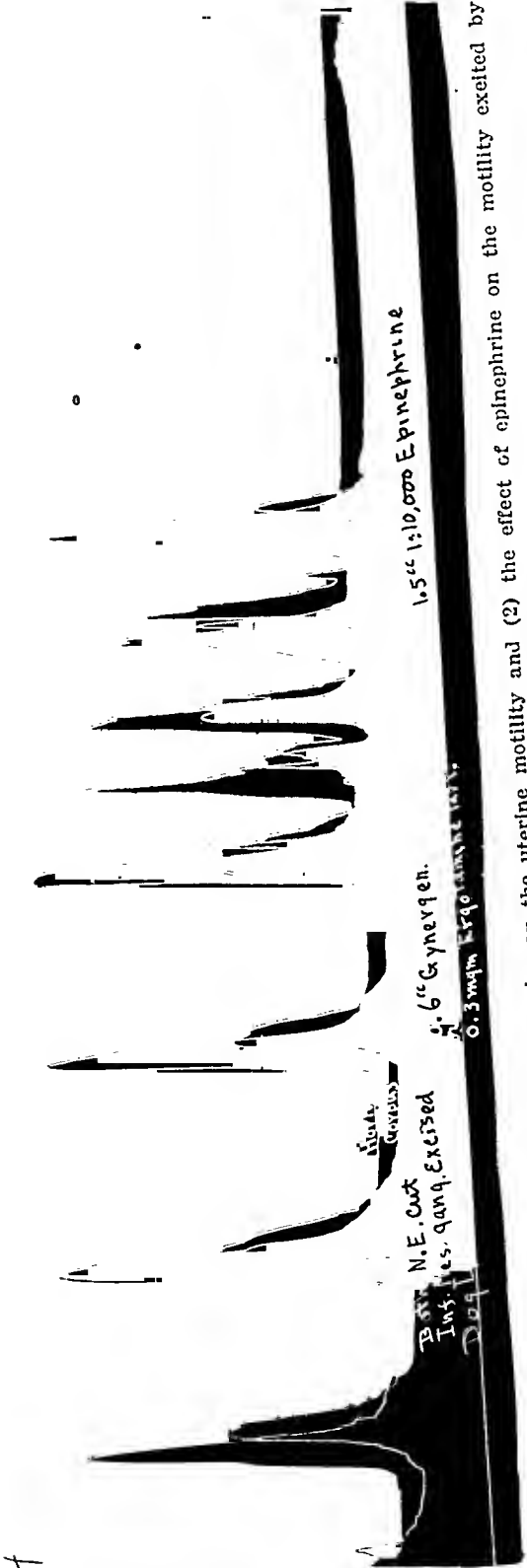


Fig. 8.—A tracing showing (1) the effect of ergotamine on the uterine motility and (2) the effect of epinephrine on the motility excited by ergotamine.

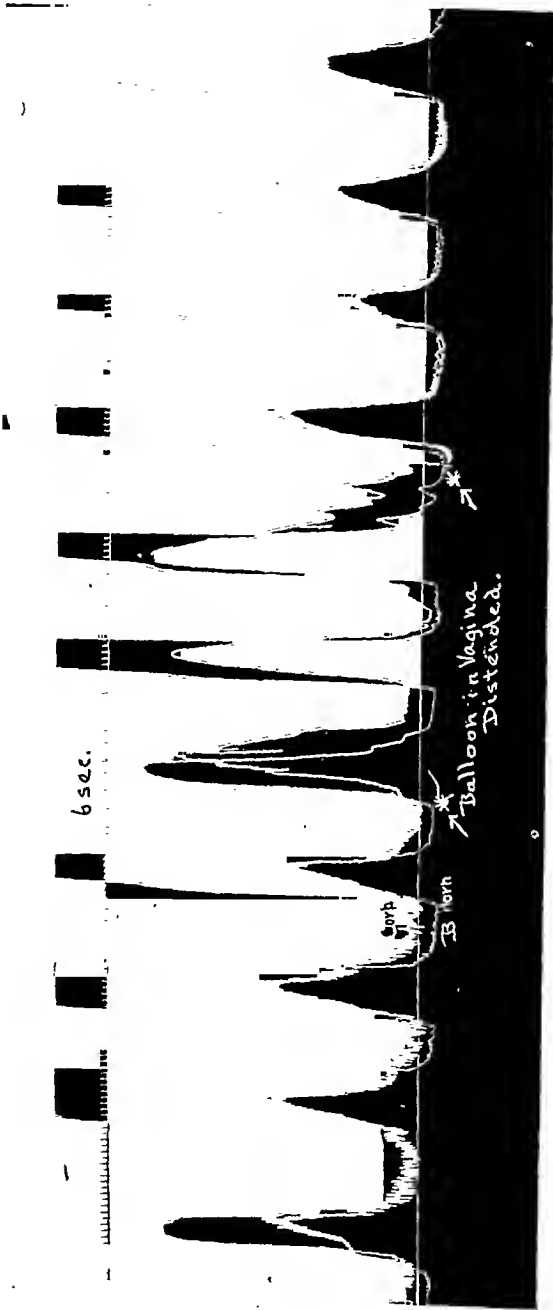


Fig. 9.—A tracing showing the effect of distension of the vagina on the uterine motility. Note that the amplitude of the contractions of the corpus uteri are increased.

tion. In the pregnant uterus in labor, epinephrine caused temporary relaxation. In 3 of 6 dogs epinephrine caused a single contraction followed by relaxation, in 3 others it caused only relaxation. The period of relaxation or inhibition lasts from three to ten minutes following one dose (Fig. 4).

Epinephrine not only abolishes spontaneous uterine motility in the pregnant and postpartum uterus of the dog, but will inhibit the contractions caused by "gynergen" or ergotamine tartrate, and pituitrin (Fig. 6).

Pituitrin: The injection of $\frac{1}{2}$ c.c. of pituitrin causes a marked increase in the rate and amplitude of the contractions of the postpartum uterus (Fig. 7). The circular musculature is chiefly affected. In the pregnant uterus in labor pituitrin causes marked circular contraction of the horns and corpus uteri, which means that it would interfere with normal labor in the dog.



Fig. 10.—This photograph shows the experimental rupture of the uterus that occurred in dog "G."

Ergotamine Tartrate: Ergotamine tartrate increases the rate and amplitude of the contractions of the horns and corpus uteri. We have only tested it on the postpartum uterus of the dog (Fig. 8).

All animals were under light barbital or ether anesthesia, chiefly the former.

Distention of the Vagina.—Insertion of a balloon into the vagina of a dog under light anesthesia stimulates respiration. Distention of the balloon increases the contractions of the horn and corpus uteri of the postpartum uterus (Fig. 9). Section of the nerve erigens abolishes the respiratory, but not the uterine effect of this procedure.

Experimental Rupture of the Uterus.—Having observed that (1) the normal progress of labor in the dog caused marked contraction of the cornual ampulla and a marked dilatation of the corpus uteri, and (2) that there is a marked tendency toward polarity in the uterine mechan-

ism, it occurred to us that the corpus uteri in the dog might be analogous to the lower uterine segment in man. For these reasons we felt that if an obstruction of the vagina or pelvic canal were produced, a rupture should occur in the corpus uteri.

Two pregnant dogs, near term, were laparotomized and a cotton tape was placed about the vagina one inch below the cervix in such a manner as not to constrict the vagina nor interfere with the blood supply in any way, but would serve only to prevent the presenting part from passing.

Dog "G" went into labor on the twelfth day and died on the fourteenth day. Postmortem examination revealed a longitudinal tear in the corpus uteri in the posterior left quadrant not involving any large blood vessels, which extended from

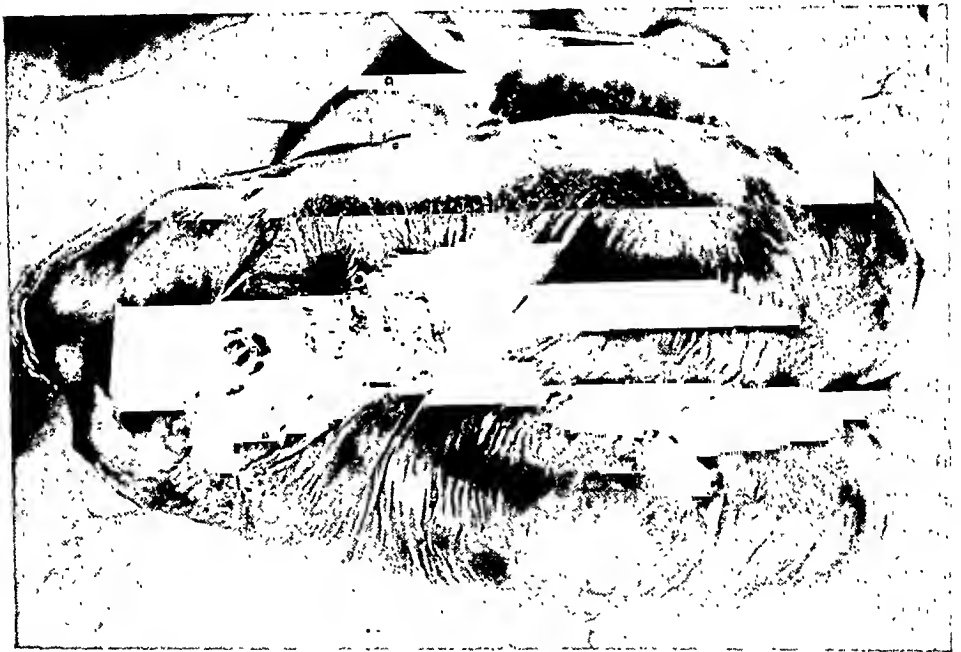


Fig. 11.—This photograph shows the experimental rupture of the uterus that occurred in dog "J."

the left fundal sphincter through the cervix and one-half inch into the vagina (Fig. 10). The fetuses were in the abdominal cavity and only a small quantity of blood was present. Dog "J" went into labor on the fourth day and died on the fifth day. Postmortem revealed the abdomen to be filled with blood. An "L"-shaped tear was present in the anterior aspect of the corpus uteri, which had caused the rupture of a rather large branch of the uterine vessels (Fig. 11). Two fetuses were present in the corpus uteri and the other fetuses were overlapped in the horns due to a longitudinal shortening or "retraction."

These observations demonstrate that rupture of the uterus in the dog caused by experimental disproportion occurs in the corpus uteri in which most thinning of the wall occurs, just as is the case in the human being. It also shows that the downward polarity of the uterine horns is so great under the stimulus causing it to evacuate that overdisten-

tion of the corpus uteri does not inhibit it. The observation that the dog which suffered intraabdominal hemorrhage did not deliver, confirms the observation of Barbour and Rapoport¹⁷ that hemorrhage stops uterine contractions.

DISCUSSION

The process of evacuation of the uterus is the most interesting physiologic evacuation process we have observed to occur in the mammalian organism. The coordination and purposefulness with which its musculature functions and the "timing" of the sequence of events is very remarkable. Such phenomena are best explained on the basis of an intrinsic nervous mechanism or on the basis of a specialized neuromuscular mechanism analogous to that found in the heart. One's attention is especially attracted to the action of the musculature of the dog's corpus uteri. As the fetus enters, it dilates to receive it. When the fetus is fully within its cavity, it contracts to expel it. In other words the corpus uteri acts much like the stomach, it manifests receptive relaxation as food enters it and after food has entered, it moves to evacuate it according to a definite polarity. The question arises as to what causes the corpus uteri to operate in this manner, which is important because it has a bearing on the human lower uterine segment. Obviously the cause might be due to mechanical distention or nervous inhibition. Receptive relaxation in the stomach is due to a nervous inhibitory mechanism. Muscle when stretched is usually caused to contract, unless it is inhibited by nerves or chemicals. If overstretched it is injured. The musculature of the corpus uteri contracts after it has been dilated. It responds to epinephrine by inhibition, a drug that acts on nerve endings. It responds to ergotamine and pituitrin by contracting. It can and does undergo much lengthening followed at an appropriate time by contraction. The logical conclusion, therefore, is that the dilating or thinning of the corpus uteri is due chiefly to a nervous inhibitory mechanism, and its contraction is due to a stimulus from the vagina or the contraction of the fundal sphincter of the horn from which the fetus has passed.

Another significant point relative to the activity of the corpus uteri is that its postpartum activity differs from its activity in labor. In labor, it only contracts to expel the fetus after the fetus has entered it. In the early postpartum state, it contracts a few seconds after each contraction of the horn. Such a difference is most logically accounted for on the basis of an intrinsic nervous mechanism and makes possible a more rapid evacuation of the lochia.

If one is permitted to assume on the basis of the above evidence that the corpus uteri in the dog is analogous to the lower uterine segment in

human beings, the logical deduction is that in human beings the lower uterine segment is formed because the musculature concerned in its formation is inhibited by an intrinsic nervous mechanism which is excited either by the stimulation of the presenting part, or the tonic or most powerful contractions of the fundus uteri, which is analogous to the pyloric sphincter-gastric-musculature relationship. It is further reasonable to deduce that after partial expulsion of the fetus and the fundus uteri has contracted and retracted to its full extent, that the uterus and the lower uterine segment may contract circularly and play some rôle in the expulsion of the fetus and in the prevention of inversion of the uterus. It is generally considered that the final expulsion of the fetus is performed by the abdominal muscles and the diaphragm which raises the intraabdominal pressure. This is obviously a factor, but is not necessarily the whole story, because women and dogs with spinal transection deliver normally (Marshall Hall,¹⁸ and Routh¹⁹). Similarly intraabdominal pressure plays an important rôle in defecation and urination, but these processes can occur in cases of spinal transection and in dogs following excision of the lumbar and sacral portion of the spinal cord. The dog, when the fetus is in the vagina, manifests the "bearing down" phenomena and in this respect is analogous to the human being. Low thoracic section abolishes the phenomena.

Our results on the stimulation of the extrinsic nerves of the uterus in the dog demonstrate that of all the hollow abdominal viscera, the uterus is the least affected by electrical stimulation of its extrinsic nerves. This means that the extrinsic nerves of the uterus in the dog play only a minor rôle in regulating its motor activity. The relation of pregnancy to change in response to stimulation of the extrinsic nerves in the rabbit has been discussed sufficiently.

By the use of our graphic method for studying the effect of drugs on the motility of the postpartum uterus, we believe that more accurate information can be gained than by any other method heretofore used. The accuracy of the method is only questioned by the fact that we record chiefly the contraction of the circular muscles and that in the postpartum uterus the longitudinal muscles are markedly contracted. Our results, therefore, only apply directly to the postpartum uterus. We have devised and will use an apparatus for recording changes in the longitudinal muscles. We have no good method for accurately recording the movements of the uterus in labor and the effect of drugs on their movements. We must rely on direct visual observation. The moving picture method would be good, but very expensive, because the processes are relatively so slow.

Our observations to the effect that pituitrin affects the circular mus-

culature to a greater extent than the longitudinal musculature correlates well with clinical experience on the action of the drug.

The observation that epinephrine abolishes temporarily the spontaneous activity of the pregnant and nonpregnant uterus of the dog in situ, and the activity excited by ergotamine and pituitrin, has a number of interesting physiologic, pharmacologic, and probably clinical aspects. The fact that in some dogs it causes a primary contraction followed by a period of relaxation complicates the situation.

The excised uterus of the nonpregnant guinea pig and cat is relaxed, but according to Cow¹³ and Tate and Clark,²⁰ after treatment with pituitrin, such excised strips are contracted by epinephrine. Our observations on the uterus of the dog in situ shows that epinephrine relaxes the pituitrin contractions. Ergotamine is supposed to reverse or antagonize the action of epinephrine on smooth muscle. We did not observe this in our experiments, since epinephrine abolished the contractions caused by ergotamine. Our observations, however, confirm the generalization of Dale²¹ on the action of ergotamine, namely, that it antagonizes the augmentory, but not the inhibitory, action of epinephrine. Our results show that epinephrine antagonizes in the uterus the augmentory action of ergotamine. That epinephrine antagonizes pituitrin action on the uterus of the dog is specially significant, since pituitrin is supposed to act directly on the muscle and cause contraction irrespective of the type of autonomic innervation. This observation shows that the uterine inhibitory mechanism is still intact during pituitrin action and can be caused to function by epinephrine and its functioning decreases the effectiveness of the pituitrin contractions. The effect of epinephrine on excised strips of the pregnant and nonpregnant human uterus causes contraction, according to a number of observers. So far as we have been able to find, it has not been used extensively in the practice of obstetrics. Rucker²² reports that epinephrine caused the relaxation of a constriction ring in the uterus in three cases. Since the action of a drug on a strip of smooth muscle may not always apply to the action of the drug on the muscle in situ without anesthesia, and since the effect of epinephrine on the uterus varies in different species, the action of epinephrine on the human uterus in situ must be known before our results on the dog can be applied. Rucker's observations, if they are confirmed, would confirm our observation on the dog. Rucker's observations are still more significant in view of the observations of Carlson²³ on the action of epinephrine on the cardiac and pyloric sphincters of the stomach. Epinephrine caused the tonic sphincter to relax and the atonic sphincter to contract. If this is applicable to the uterus epinephrine might cause "contraction rings" to relax, as reported by Rucker, although it causes strips of human uterus to contract.

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303 EAST CHICAGO AVENUE.

(For discussion, see page 427.)

THE EARLY DIAGNOSIS OF PREGNANCY, CHORION-EPITHELIOMA AND HYDATIDIFORM MOLE BY THE ASCHHEIM-ZONDEK TEST*

BY S. ASCHHEIM, M.D., BERLIN, GERMANY

(From the Universitäts-Frauenklinik of the Charité Hospital in Berlin)

THE main purpose of this paper is to describe to American gynecologists and obstetricians the technic and the results of the Aschheim-Zondek test for pregnancy. The practical importance of early diagnosis of pregnancy and the unusually high degree of accuracy which this biologic test has shown in the hands of different observers, make us feel that the American profession should have a more detailed and practically helpful description of the test than is thus far available in American medical journals.

A biologic pregnancy test must be expected to give the same good results in the hands of any competent physician which it has given in the hands of the men who first came forward with it. But this cannot be said about any of the existing tests, neither of Abderhalden's reaction nor of its modification by Luetttge and von Mertz, nor about the antitrypsin test or the antithrombin test. The tests based on the changes in the sugar tolerance threshold certainly do not fulfill these requirements. Nor can the demonstration of ovarian hormone in the

*This paper was translated and revised by Dr. Alfred Plaut, pathologist at the time to the Woman's Hospital of New York, so as to include the observations with this test at the latter institution. Presented in part before the Section on Gynecology and Obstetrics of the New York Academy of Medicine, May 28, 1929.

urine of pregnant women form the basis for a reliable pregnancy test, for its amount is insufficient in the early part of gestation when diagnosis is most important; and furthermore there are women with amenorrhea who excrete large amounts of ovarian hormone with the urine but, nevertheless, are not pregnant. (Hyperhormonal amenorrhea, Zondek and Aschheim.)

Fortunately it is different with one of the hormones of the anterior lobe of the hypophysis. When one implants 10 mg. of this organ into the muscle of the thigh of an infantile mouse, the animal will go into estrus after four days. This has been demonstrated by Zondek and Aschheim and (independently) by Ph. Smith. This experiment is usually done on three-weeks-old mice weighing about 6 gm. Normally a



Fig. 1.—Normal ovary of an infantile mouse. Small primordial follicles at the periphery. Many small graafian follicles without cavity.

mouse goes into estrus in the sixth week, weighing 12 gm. The estrual changes in the vaginal mucosa (as demonstrated by the Allen test) are not directly caused by the hypophyseal hormone given off from the implanted material, but indirectly by way of the ovary. The hypophyseal substance makes the infantile ovary mature, and this leads in its turn to the change in the vaginal epithelial cells. Thus it is the ovary we have to study for our pregnancy test, not the vagina or the uterus.

Hundreds of experiments and thousands of serial sections have shown that there are three main morphologic changes in the infantile ovary under the influence of hypophyseal hormone.* The immature

*The term 'hypophyseal hormone' in this paper refers to that hormone of the anterior lobe which acts upon the ovary.

mouse ovary contains only primordial follicles and small graafian follicles without cavities (Fig. 1). The first change caused by the hypophyseal hormone is growth of follicles leading to rupture and discharge of ova into the tubes (Fig. 2). Second there occur hemorrhages in many of the enlarged follicles which are visible to the naked eye as cyanotic dots (Fig. 3). Finally atretic corpora lutea are formed in the ovary by luteinization of follicles which have not fully matured (Fig. 4). (Long and Evans.)

The substance which, in the implantation experiment, makes the changes in the ovary, is present during pregnancy, as Aschheim has found, in the decidua, in the corpus luteum, in the placenta, in the amniotic fluid, in the young embryo, in the blood serum in large quan-

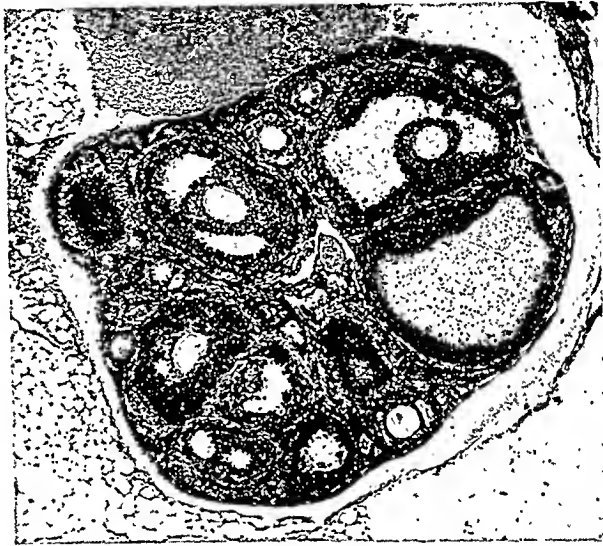


Fig. 2.—Large graafian follicles ready to rupture. Together with such a picture in the ovary one generally finds uterus and vagina in estrus with positive Allen test. This, however, does not represent a positive pregnancy test.

ties and, most important, in the urine of the pregnant woman. This excretion of the hypophyseal hormone in the urine of the pregnant woman forms the basis of the Aschheim-Zondek pregnancy test.

TECHNIC

A voided morning specimen is used. It should be in a clean bottle. Sterile specimens are not necessary. The mice are highly resistant against ordinary infections. When the test cannot be made immediately, if, for example, the specimen has to be sent by mail, a drop of pure cresol to 30 c.c. of urine, should be added. It is best to send one specimen with cresol and one without. The first morning specimen, before any intake of food or fluid is more concentrated than day specimens.

Five infantile mice are used for each test. Breeding mice has difficulties and inconveniences, and frequently it is preferable to buy mice from a dealer. During the few days which the test takes, the mice are kept in glass jars. If peat is used for bedding no odor from the animals will be noticeable. Bread and water

are sufficient nourishment. Lean mice are easier to handle at the end of the test than fat ones, therefore, it is not advisable to give them milk. In Berlin mice weighing from 6 to 8 gm. were found satisfactory; about 10,000 were used. In New York working with several hundreds of mice seems to indicate that in this climate mice over 7 gm. of weight should not be used. On the other hand, mice weighing not more than 5 gm. have been used without increase of the mortality rate. The mice are weighed before the test. The labeling can be done simply with a fine brush and concentrated carbolfuchsin. If one is not accustomed to working with small animals, a little practice is required to distinguish males from females, notably when they weigh less than 6 gm. For this reason, and because occasionally a mouse may die, 6 mice should be used for a test. The additional expense and work are very small, and it may save doctors and patients from disappointments. The injections are made subcutaneously laterally in the back.

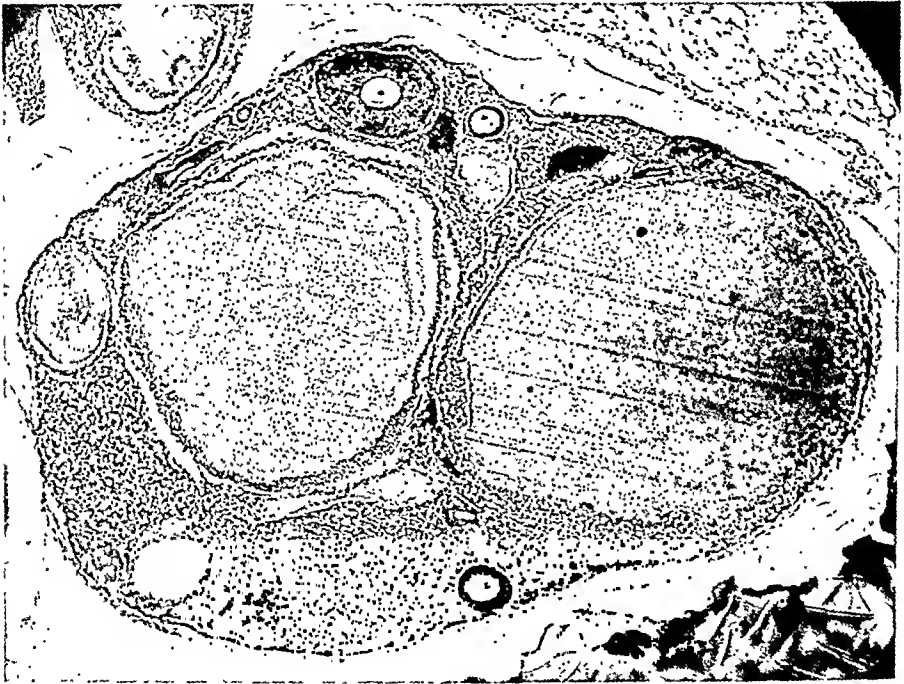


Fig. 3.—Hemorrhage in much enlarged follicles which are easily visible to the naked eye. The hemorrhage is caused by the hypophyseal hormone. Pregnancy test positive.

An assistant holds the mouse with the left hand by the tail. His right hand grasps one ear with a forceps, the tips of which are protected by rubber tubing from a blood counting outfit. A tuberculin or insulin syringe is used. Care must be taken not to enter the pleural or peritoneal cavities with the needle; immediate death would be the result.

The mice receive six injections, three on the first day and three on the second. The single doses are: 0.2 c.c. for mouse No. 1; 0.25 c.c. for mouse No. 2; 0.3 c.c. for mouse No. 3 and for mouse No. 4; and 0.4 c.c. for mouse No. 5. If one uses 6 mice, two of them receive the 0.25 dose. One hundred hours after the first injection, the mice are killed by illuminating gas and laparotomized. Thus Monday, Tuesday and Thursday are best for starting the test. The reading is done by inspection of the ovaries with the naked eye and with a hand lens. By gently pulling the uterine horn, the ovary appears from under the lower pole of the kidney, together with more or less fat tissue. The ovaries of untreated infantile mice

are pale greyish pink and hardly the size of a pinhead. If all the ovaries have that appearance, the test is negative for pregnancy regardless of the condition of the uterus. The ovaries of mice after injection of urine from pregnant women are twice or three times larger and distinctly red, presenting submiliary yellowish protrusions which correspond to the corpora lutea, or cyanotic protrusions which are due to hemorrhage into a follicle or a corpus luteum. This is the positive reaction. It is often, but by no means always, accompanied by swelling and hyperemia of the uterus. If one is doubtful about the ovaries, serial sections are necessary. The ovaries are fixed in Zenker's solution and embedded in paraffin. It does not take long to cut these very small organs in ribbons. The microscopic finding of even one single corpus luteum renders the test positive. With proper technic the delay caused by the microscopic examination is not much more than one day.

When the ovaries contain very large follicles and when at the same time an early pregnancy is suspected clinically, the test should be repeated.



Fig. 4.—Three large corpora lutea. In one of them the ovum can be seen. Such corpora lutea are generally but not always visible to the naked eye. Pregnancy test positive.

By injecting larger amounts of urine at shorter intervals one often can make the diagnosis as early as from 60 to 70 hours after the beginning of the test. But in general the technic as described is satisfactory.

CONTROLS

Together with Zondek, Aschheim has examined over 1000 specimens of urine. We must assume that small amounts of the hypophyseal hormone are present in the blood of adult persons. The enormous increase in amount and the excretion through the kidneys are the characteristic feature in pregnancy. In Table I the results from 470 urine specimens are charted, all from nonpregnant women or from men.

In these controls one male urine specimen and one urine specimen from a nonpregnant woman (cystitis) gave a positive test. In both urines the test was repeated and found negative. Probably speci-

TABLE I. CONTROLS

	NUMBER	POSITIVE	NEGATIVE
Healthy women	40	0	40
Climacteric women	12	0	12
Female patients not pregnant	60	0	60
Women with irregular bleeding	10	0	10
Healthy men	16	1	15
Internal diseases	20	1	19
Disturbances of internal secretion	40	0	40
Inflammatory gynecologic conditions	20	0	20
Benign ovarian tumor	25	0	25
Myomata uteri	35	0	35
Carcinoma	66	2	64
Amenorrhœa	126	0	126
Total	470	4	466

mens had been mixed; nevertheless, these cases are put down as failures. In two urines from patients with advanced carcinoma of genital organs the test was positive. In advanced carcinoma the anterior lobe of hypophysis sometimes shows changes similar to those regularly found in pregnancy.

The cases of amenorrhœa constitute the most important group among the controls. None of the 126 gave a positive test. In one other case the family physician had diagnosed pregnancy because of a missed period; the test was positive, but after a while the patient had some bleeding which probably has to be explained as early abortion. In a further instance the reaction was first positive and later became negative; it was a missed abortion, and the second specimen had been taken after the death of the embryo.

In many of the control tests, notably from patients with myxedema, Graves's disease, myoma or carcinoma, large follicles were found in the ovaries of the injected mice. But the changes which are characteristic of pregnancy, namely, the corpora lutea and the hemorrhages, were absent.

TABLE II. TESTS ON URINES FROM NORMAL PREGNANCY

	NUMBER	POSITIVE	NEGATIVE
5 to 6 weeks	92	89	3
7 to 8 weeks	100	98	2
3 to 10 months	172	169	3
Early pregnancy of the first 8 weeks without exact menstrual data	46	46	0
Total	410	402	8

Two hundred and thirty-eight of the urine specimens in Table II from pregnant women were from the first eight weeks of pregnancy. Two hundred and thirty-three of them gave a positive test. That means an accuracy of nearly 98 per cent. In the five tests which gave

negative results the follicles in the ovaries were enlarged and another specimen was asked for on account of this enlargement. In all five urines the reaction then was positive. It is advisable when one sees enlarged follicles and when there is a clinical suspicion of early pregnancy to repeat the test. Several times the test was found positive as early as three to five days after the date of the expected menstruation.

The tests listed in Tables I and II total 880 with 12 failures, an accuracy of 98.6 per cent. This is a very good result in a biologic method in view of the fact that a universally applied test like the Wassermann reaction yields not more than 94 or 95 per cent of correct results.

The reaction becomes negative about the eighth day after delivery. It has been found positive on the ninth and on the twelfth day after abortion. It remains positive as long as living placental tissue is in biologic contact with the maternal blood. Therefore in tubal gestation we can expect a positive result only when the embryo is alive or not later than about eight to ten days after its death. But in the cases with living embryo the diagnosis is more important. After the death of the embryo the worst danger generally is over. The results in 30 cases of tubal gestation were in conformity with the clinical and operative findings.

THE DIAGNOSIS OF HYDATIDIFORM MOLE AND CHORIONEPITHELIOMA

The urine of patients with hydatidiform mole gives a very strongly positive reaction. In one instance it was twelve times stronger than the reaction usually obtained in the second month of gestation (measured by the minimum dose of urine which gave a positive mouse test). Since there is no embryo in hydatidiform mole, it must be the living tissue of the mole that is responsible for the positive reaction.

In one case of chorionepithelioma in Stoeckel's clinic the test was found strongly positive. One should, therefore, make the test when there is clinical suspicion of chorionepithelioma and always after a hydatidiform mole has been expelled. The test, however, may remain positive after hydatidiform mole as long as two months without evidence of chorionepithelioma.

In a pregnant monkey the test was found positive. The urine of other pregnant animals did not give the reaction. So far the cow, the pig, the rabbit, the mouse and the elephant have been studied.

As stated in the beginning, the weakness of most pregnancy tests is shown by the fact that other investigators do not have as good results as the originators of the test. But the Aschheim-Zondek reaction has been used in the University Clinic of Frankfurt in 350 cases with 98 per cent accuracy. In Schaefer's clinic in Charlottenburg the same percentage was obtained in 100 cases. Hospitals in Vienna and in

St. Petersburg report the same good results. Fifty cases were examined in the Woman's Hospital in New York with one error which, however, cannot be ascribed to the method.

SUMMARY

1. Pregnant women excrete large amounts of hypophyseal hormone with the urine.

2. Injection of urine from a pregnant woman into infantile mice leads to formation of corpora lutea and to hemorrhages in the ovary.

3. This reaction (Aschheim-Zondek test) is positive in 98 per cent of the cases of pregnancy.

4. The technic of the test is described in detail.

5. Demonstration of hypophyseal hormone in the urine is a reliable method for the diagnosis of pregnancy.

6. In ectopic gestation and in abortion the test is positive as long as living fetal tissue is in biologic contact with the blood of the mother.

7. The test has been found strongly positive in hydatidiform mole and in chorionepithelioma.

Fraenkel, L.: Abdominal and Vaginal Methods of Operation in Obstetrics and Gynecology. *Monatschr. f. Geburtsh. u. Gynäk.* 82: 79, 1929.

According to Fraenkel myomas may quickly be removed vaginally, but the technic is not easy and considerable experience is necessary to perform the operation smoothly. Ovarian tumors and tubal pregnancies are now seldom removed vaginally. Inflamed adnexa can be removed through the vagina, and the operation is made less difficult where the uterus is removed as well as the adnexa. Extensive intestinal adhesions, however, can be separated only by laparotomy. Another indication for vaginal operation is carcinoma of the cervix, but Fraenkel prefers the abdominal route for cancer of the corpus, chorioepithelioma and sarcoma. Pelvic abscesses should of course be opened through the vagina, and most vesical fistulas can readily be closed from below.

In obstetrics many operations can be performed vaginally, especially interruption of pregnancy. In performing a vaginal hysterotomy the author prefers the method of Kakousehkin according to which the incision in the uterus is made directly in the anterior uterine wall without first splitting the cervix. The author compares the results of operative deliveries performed vaginally and by cesarean sections chiefly in answer to Max Hirsch's plea for the performance of more cesarean sections. Fraenkel's statistics favor vaginal delivery.

J. P. GREENHILL.

THE SERUM PROTEINS IN THE TOXEMIAS OF PREGNANCY

BY NICHOLSON J. EASTMAN, M.D., BALTIMORE, MD.

(From the Department of Obstetrics, the Johns Hopkins Hospital and University)

OF THE various chemical studies which have been made on the blood in pregnancy, few have shown such discrepancy as those dealing with the serum colloids. This was particularly emphasized by Plass and Mathew in 1926,¹ when they reviewed the literature and pointed out that some authors had found that the serum albumin was increased during gestation, while others had noted a marked decrease. They likewise found a similar lack of uniformity characterizing the reports on the serum globulin. In their own investigation of the plasma proteins in normal pregnancy, they found a definite decrease in the albumin and a slight relative increase in the globulin, but reported no figures upon the toxemias of pregnancy.

Recently, several studies have appeared from European sources, more particularly those of Seitz and Eufinger^{2, 3, 4} in which very decided colloidal changes are reported in the blood of pregnant women. Thus, these workers found that while the albumin-globulin ratio in normal nonpregnant women averages 2.6, it approximates 0.8 in normal pregnant women at term, and ranges at even lower levels in the toxemias, sometimes even approaching 0.2. They also found that in pregnancy the stability of the plasma colloids is greatly reduced, as shown by the fact that it is possible to precipitate these bodies consistently by concentrations of salt which are without effect upon the plasma of normal nonpregnant women. Moreover, these authors feel that the changes which they describe in the blood colloids are primary and, through their influence on the availability of blood cholesterol, may be the etiologic factors in the production of a certain type of eclampsia, which they designate "dyscolloidosis," or "Labilitätseklampsie."

The serum proteins, quite apart from the findings of Seitz and Eufinger, are of great physiologic importance. Thus, they comprise over 80 per cent of the solid substances of the serum and are primarily responsible for its viscosity. Whipple⁵ has shown that reduction in the plasma proteins by means of plasmapheresis, a process by which the whole blood of an animal is replaced by a suspension of red cells in Locke's solution, results in a condition of shock which proves fatal whenever the protein depletion reaches a certain level. These bodies also play an important part in the buffer mechanism of the blood. Furthermore, they are probably concerned in regulating the distribution of water between blood and tissues, and in this connection may

be intimately associated with the production of edema. In view of these many important relationships, it has seemed worth while to investigate the behavior of the serum proteins during gestation and, because of the findings of Seitz and Eufinger, to direct particular attention to the albumin-globulin ratios in the toxemias of pregnancy.

METHODS

A. *Chemical*.—Serum albumin and globulin do not lend themselves to exact determination, as the best methods are associated with a maximal error of about 5 per cent; whereas if parallel determinations are made on the same serum by different methods, the variations are sometimes even greater.

There are several sources of error which account for the variable results obtained. Stasis during venipuncture increases the serum protein content⁶; addition of oxalate, through its effect on the distribution of water between plasma and cells, diminishes the total protein⁷; long contact of serum with the clot from which it has separated gives an apparent shift in the total protein⁸; hemolysis increases the apparent quantity of the albumin or globulin fraction depending on whether hemoglobin is precipitated with the albumin or globulin⁹; if the "neutral salt" used for precipitation of globulin has a P_H of less than 5.4, considerably more protein is precipitated as globulin¹⁰; saturated solutions of ammonium and magnesium sulphate vary in strength according to the temperature at which they are kept, and are likely to give higher globulin values in warm weather than in cold.

All chemical methods for the determination of serum proteins comprise two chief steps: First, the precipitation of the globulins by "salting out" by means of certain neutral salts, usually magnesium, ammonium or sodium sulphate, a process consisting essentially in the withdrawal of water from the globulin molecule by the highly concentrated salt. Second, the filtration and determination of the separated protein fractions either by Kjeldahl or by colorimetric procedures. In the course of the present study three chemical methods have been employed: Kjeldahl analysis as modified by Howe,¹¹ and the colorimetric procedures of Wu and Ling,¹² and of Greenberg.¹³

B. *Physical*.—It will be recalled that when a beam of light passes obliquely from one medium into another, it is usually bent at the surface separating the two, a phenomenon known as refraction, the degree of refraction being constant for any given medium and an additive property of the refractive power of the individual atoms making up the medium. For this reason, the serum proteins with their large molecular weights (14,000-16,000), manifest marked refractivity and so lend themselves to quantitative estimation as shown by the degree of refractivity presented by a given solution of them. While methods based on this principle, such as that of Robertson,¹⁴ offer the possi-

bility of making rapid and rather accurate determinations of the serum proteins, the results tend to be too high when compared with those obtained by the Kjeldahl procedure,^{15, 16, 17} the error being greatest in blood serum with a high globulin content.¹⁵ The various errors inherent in the refractometric method have been reviewed both by Howe⁹ and by Reiss,¹⁸ but since it was employed by Seitz and Eufinger in their studies on the serum proteins in pregnancy, it has been utilized in the present investigation for purposes of comparison.

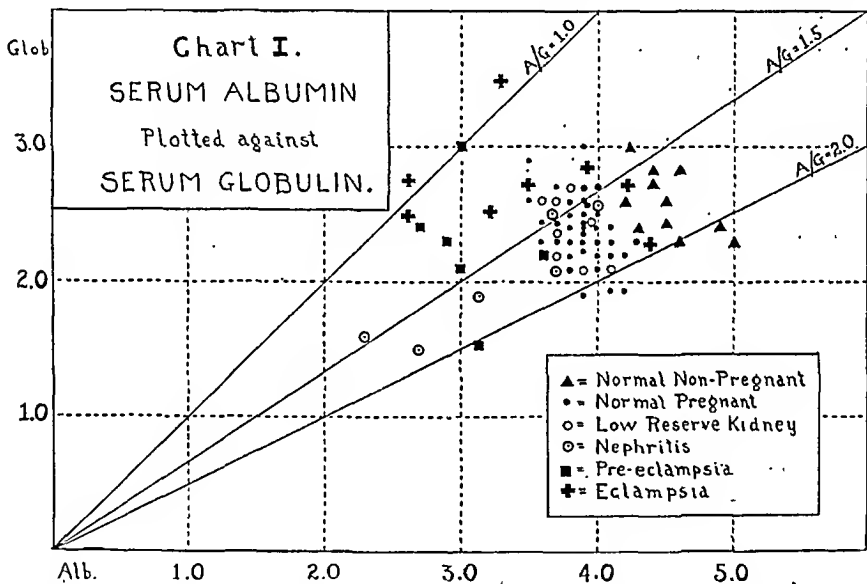
The serum proteins are colloids and as such may be expected to exhibit the properties peculiar to colloidal solutions. The methods thus far mentioned for the determination of serum proteins are based principally upon the difference in solubility of albumin and globulin in certain salt solutions without reference to the difference in colloidal states. Possibly the most fundamental colloidal characteristic is the size of the individual molecule, that of globulin being considerably larger than that of albumin. Consequently, we have deemed it advisable to employ among others a method by which serum albumin and serum globulin are differentiated by means of this colloidal distinction. Such a procedure is the refracto-viscosimetric method of Rohrer,¹⁹ which is based upon the difference in the viscosity of albumin and globulin solutions resulting from the difference in the size of the molecules concerned. By determining the total protein content by means of the refractometer, the albumin-globulin ratios may be estimated by the relationship between the refractometric index and the viscosity, as indicated in Chart II. Howe⁹ has pointed out that this method does not give correct absolute values, as the results tend to be too high, particularly in pathologic cases, but at the same time, it gives fairly concordant relative results, the albumin-globulin ratios, in particular, affording probably significant indications of the colloidal states of these bodies.

The refractometric readings in the present study were made with an Abbe refractometer, while serum viscosity, compared to that of water, has been determined at a constant temperature of 37° C. by means of an Oswald viscosimeter.

RESULTS

The average results obtained by the various methods on sera from normal nonpregnant women, normal gravidas and from patients suffering from the toxemias of pregnancy are shown in Table I, the cases being grouped according to the classification²⁰ used in this clinic. While the figures indicate an approximate agreement between the three chemical procedures, the absolute results obtained by means of the physical methods are decidedly high. The change which the serum proteins undergo, however, appears to be the same by whatever

method studied, namely, there is a decrease in total protein, associated with a very slight relative increase in globulin in normal pregnancy, and a more marked, absolute increase in preeclampsia and eclampsia. This tendency toward a decrease in the albumin-globulin ratio is shown diagrammatically in Charts I and II. In the former only the figures obtained by the Howe method are used since this procedure is probably the most generally accepted and gives values closely approximating the absolute figures. In Chart II are plotted the results obtained by the refracto-viscosimetric procedure, the relative viscosity being shown on the abscissae, the refractometric index in Pulfrich units on the ordinates, while the albumin-globulin ratios are indicated by the curves of Rohrer. It will be noted that in normal pregnancy there is a decrease in serum viscosity but that this diminution is less propor-

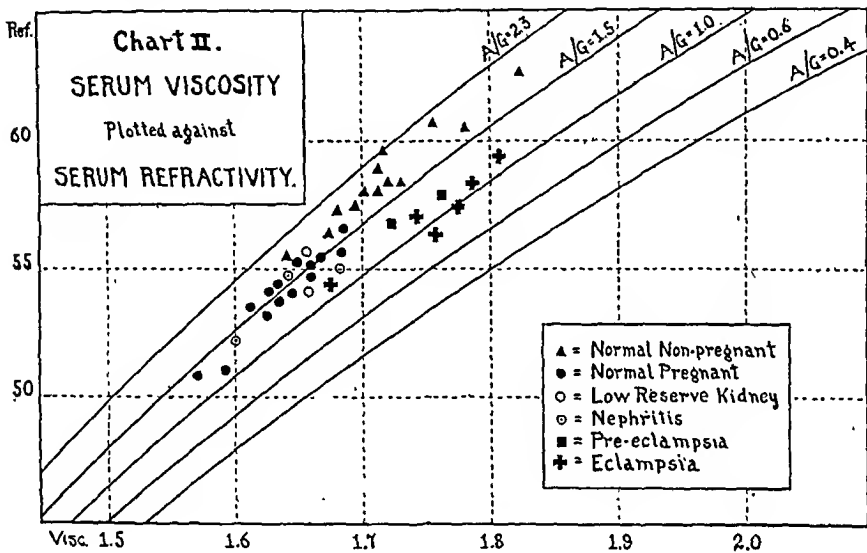


tionately than that occurring in the serum refractivity. In other words, the slight increase in the more coarsely dispersed and more viscous protein, globulin, has tended to some extent to prevent the fall in viscosity which would be expected to accompany the decrease in total protein.

It should be noted that the average viscosity values in eclampsia exceed those observed in normal pregnancy, as well as those in normal nonpregnant women. Since total protein is not increased in eclampsia, this increase in viscosity can readily be explained on the basis of the proportionate increase in globulin. It may be remarked, however, that even the marked changes revealed by this method by no means approach in extent the alterations reported by Seitz and Eufinger. Our averages for the albumin-globulin ratios in normal nonpregnant women, normal gravidas, and eclamptic patients are 1.8, 1.5, and 1.2, respectively, as compared with 2.6, 0.8, and 0.2 as reported by Eufinger.

In low reserve kidney and nephritis without albuminuria, the values for the serum proteins are approximately the same as in normal pregnant women. When, however, protein loss through the urine has existed for some time, very low figures are obtained, total serum protein ranging from 4.0 to 5.5 gm. per 100 c.c.; and similar observations were made in cases of eclampsia and preeclampsia with long-standing albuminuria. In the two cases of severe hyperemesis gravidarum studied, there was a marked globulin increase with the albumin-globulin ratio approximating that found in eclampsia.

Finally, it should be emphasized that the results obtained in this study, as well as in those of most other investigations upon serum proteins, show wide individual variations. In no group of cases are the



changes characteristically constant, and, consequently, we agree with Howe⁹ that it would be hazardous to regard certain definite albumin-globulin ratios as characteristic of certain pathologic conditions.

COMMENT

The fall in total serum protein during pregnancy has usually been attributed to blood hydration, an explanation in keeping with the work of Stander and Tyler,²¹ showing that blood moisture increases considerably during gestation. In the opinion of Plass, this watery dilution is closely associated with an increase in the amount of the hydrophilic plasma protein, fibrin. Since very slight changes in hydrogen-ion concentration of the plasma affect appreciably the hydration capacity of the proteins, it has been suggested that changes in this factor may explain the blood dilution of pregnancy, although recent studies²² in this department, indicate that the hydrogen-ion concentration of the serum is within normal limits in uncomplicated pregnancy.

Whatever its mechanism, the decrease in serum protein, together with the concomitant fall in total serum base and bicarbonate, is the most constant and striking chemical change that has yet been demonstrated in the blood during pregnancy.

Since 1896, when Starling²³ first stated his concept of the forces concerned in the exchange of fluid between capillaries and tissue spaces, the serum proteins have been generally recognized as important factors in the water regulation of the body. It will be recalled that Starling made the observation that the osmotic pressure of the blood serum, when dialyzed against a protein-free filtrate from the same serum, is from 30 to 40 mm. of mercury and that it corresponds very closely to the average hydrostatic pressure in the capillaries. For this reason, we may assume that there is normally a balance in the capillaries between the processes of exudation and absorption, the former being conditioned by the capillary blood pressure and the latter by the difference in protein content between the blood plasma and tissue lymph. Diminution in serum protein may then be expected, through decreasing osmotic pressure, to effect a corresponding reduction in the absorption of tissue fluids into the capillaries. While in

TABLE I. SHOWING OUR RESULTS OBTAINED BY THE VARIOUS METHODS

NO. CASES		TOTAL PROTEIN GRAMS	ALBU-MIN PER 100 C.C.	GLOB-ULIN	ALBUMIN-GLOBULIN RATIO
<i>Howe's Method</i>					
11	Normal nonpregnant	7.1	4.5	2.6	1.7
36	Normal pregnant	6.3	3.9	2.4	1.6
8	Low reserve kidney	6.2	3.8	2.4	1.6
6	Nephritis	5.2	3.2	2.0	1.6
6	Preclampsia	5.4	3.1	2.3	1.3
8	Eclampsia	6.1	3.4	2.7	1.3
<i>Wu-Ling's Method</i>					
5	Normal nonpregnant	6.8	4.5	2.3	2.0
18	Normal pregnant	6.1	4.0	2.1	1.9
3	Nephritis	5.1	3.2	1.9	1.7
4	Eclampsia	6.2	3.7	2.5	1.5
<i>Greenberg's Method</i>					
10	Normal nonpregnant	7.1	4.8	2.3	2.1
22	Normal pregnant	6.4	4.2	2.2	1.9
5	Eclampsia	6.5	3.7	2.8	1.3
<i>Robertson's Method (Refractometric)</i>					
6	Normal nonpregnant	8.0	5.6	2.4	2.3
10	Normal pregnant	6.8	4.7	2.1	2.2
4	Eclampsia	7.7	4.9	2.8	1.7
<i>Rohrer's Method (Refracto-viscosimetric)</i>					
17	Normal nonpregnant	7.8	5.0	2.8	1.8
14	Normal pregnant	7.0	4.2	2.8	1.5
3	Low reserve kidney	7.2	4.2	3.0	1.4
2	Nephritis	6.7	4.0	2.7	1.5
2	Preeclampsia	7.6	4.2	3.4	1.2
6	Eclampsia	7.4	4.0	3.4	1.2

the present study our observations on toxemia of pregnancy with marked edema are limited to six patients, five classified as chronic nephritis and one as preeclampsia, our findings indicate that low serum protein may be a dominant factor in the production of general edema in such conditions. This becomes the more probable when it is remembered that these six patients were the only ones in the series in which the total serum protein values fell below 5.1 gm. per 100 c.c., while in the two patients with the most extensive edema, the figures were below 4.3. Conversely, in patients without general edema the lowest value for total serum protein was 5.5.

That low serum protein is not the only factor involved, however, is clearly evidenced by Table II in which are listed certain observations made at frequent intervals in a case of pregnancy complicated by nephritis. In this patient the edema disappeared within a few days following delivery, although the serum proteins maintained their low level for more than a week, a phenomenon noted in all our cases with edema. Accordingly, while low serum protein may be said to play an active part in the production of edema in the toxemias of pregnancy, there apparently must be some other important factor, as yet unknown, involved in the water balance.

TABLE II. SERUM PROTEIN STUDIES (WU-LING METHOD) ON E. V., HOSP. NO. 21,132, WHITE PRIMIGRAVIDA, AGE THIRTY-THREE, TWIN PREGNANCY, NEPHRITIS. B. P. 170/120; URINARY ALBUMIN 5 GM. PER LITER

DATE 1928	TOTAL PROTEINS GM. PER 100 C.C.	ALBUMIN GM. PER 100 C.C.	GLOBULIN GM. PER 100 C.C.	ALBUMIN-GLOBULIN RATIO	FLUID INTAKE C.C. PER 24 HR.	FLUID OUTPUT C.C. PER 24 HR.	WEIGHT POUNDS	NOTES
10/10	4.5	2.8	1.8	1.6	1500	700	167	Marked general edema
10/11	4.6	2.8	1.7	1.5	2300	850		Delivery
10/12	4.4	2.7	1.7	1.6	2700	2075	148	
10/13	4.4	2.7	1.7	1.6	4300	2200		Edema disappearing
10/14	4.5				2200	1050	138	
10/15		2.7	1.8	1.5	1100	1000		No edema
10/18	5.1	3.1	2.0	1.5			130	
10/29	5.9	3.8	2.1	1.8			126	Discharged

The decrease in albumin-globulin ratios in preeclampsia and eclampsia apparently involves a dual process; albumin loss through the kidneys and increased globulin formation. The damage to the glomerular capillaries which permits the passage of the smaller albumin molecule is probably part of a general vascular change^{24, 25} which permits a certain amount of leakage of albumin into the tissue spaces throughout the body; and it will be noted that such a process would still further decrease the osmotic forces of the blood. The increased globulin formation, while less easy of explanation, seems to represent in part a natural protective response of the body to a decrease in total serum protein. Such a view, at least, would conform with the studies

of Whipple⁵ in which it was shown that in the regeneration of plasma proteins following experimental depletion, the following sequence is observed, fibrinogen, globulin, albumin. That the liver, the probable site of formation of the serum proteins, is also a factor is indicated by the recent work of Bodansky²⁶ in which decided decreases in the serum albumin-globulin ratios were noted in dogs following liver stimulation by anemia. From a more general standpoint, Linder, Lundsgaard and Van Slyke¹⁷ take the view that the formation of plasma globulins is the primitive form of protein production to which the body returns in disease.

The contention of Seitz and Eufinger that high serum globulin may actually cause a definite and special type of eclampsia is based on the fact that an inverse relationship exists between the cholesterol that can be extracted from the serum with ether and the globulin content. In the opinion of these authors this quantitatively decreased availability of cholesterol in the presence of high globulin, through its effect upon blood vessel tonus and cell permeability, accounts for the metabolic disturbances in certain of the toxemias. While cholesterol studies have not been included in the present investigation, daily serum protein analyses on cases of eclampsia indicate that high globulin may persist for days after the patient has recovered and in no way parallels the severity of the disease. On this account, it would seem more logical to regard the low albumin-globulin ratios seen in certain cases of eclampsia as a secondary phenomenon, rather than as the actual cause of the disease.

In conclusion, it may be noticed that in our study we have dealt only with the serum proteins without consideration of the important plasma protein, fibrin. The decided increase that the latter undergoes in pregnancy and in the toxemias has been demonstrated by many workers and seems to be so clear-cut and constant as not to need further confirmation. The importance of fibrin in regulating such phenomena as blood stability is indicated by its intimate relationship with the rate of sedimentation of the red cells.¹ Moreover, when the serum of pregnant women and eclamptic patients is tested by the Gerloczy²⁷ reaction, the alterations in stability noted by Eufinger, who used plasma, are not observed. It thus seems probable that fibrin, rather than albumin or globulin, plays the dominant rôle in the regulation of plasma stability in pregnancy.

CONCLUSIONS

1. The general direction of the changes which the serum proteins undergo during gestation and in the toxemias of pregnancy is toward a decrease in total protein, associated with a very slight relative increase in globulin in normal pregnancy, and a more marked absolute one in preeclampsia and eclampsia.

2. The average value for the albumin-globulin ratio in normal non-pregnant women, in normal gravidas, and in eclampsia and pre-eclampsia is 1.7, 1.6, and 1.3, respectively.

3. As high serum globulin may persist for days after recovery from eclampsia, and in no way parallels the severity of the disease, it should probably be regarded as a secondary phenomenon.

4. With persistent albuminuria, total serum protein may fall to very low levels, 4.0 to 5.0 gm. per 100 c.c. Such an alteration decreases the osmotic pressure of the blood and probably plays an important rôle in the production of edema in the toxemias of pregnancy.

5. Changes in the stability of the plasma in gestation and in the toxemias of pregnancy are the result of increased fibrin rather than of changes in serum albumin or serum globulin.

6. Our results disagree with those of certain European workers, who find decided alterations in the serum proteins in pregnancy and assign to them a causative rôle in the production of eclampsia.

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A COMPARATIVE STUDY OF THE ANTERIOR HYPOPHYSES IN THE PREGNANT AND NONPREGNANT STATES*

BY ALFONS ROSTHORN BACON, B.S., M.D., CHICAGO, ILL.

(From the University Clinic for Women, Breslau, Director: Professor Ludwig Fraenkel)

LESS than two years ago Zondek and Aschheim published their important studies on the anterior hypophysis and demonstrated the specific action of its hormone on the female sex organs. In the same year they, Fels, and others first demonstrated the large amount of this hormone in the blood and in the urine of pregnant women. It had already been shown that the female sex hormone is present in the blood and urine in the second half of pregnancy, but not in the first half and especially at the very beginning of pregnancy, as is the case with the anterior hypophysis hormone. Their discovery that the infantile female white mouse reacted to this hypophysis hormone by developing estrus when the castrated adult or infantile mouse did not, led to the use of the infantile female white mouse as the general test object. By their extensive study they claimed to be able to prove that the anterior hypophysis is the activator or motor of the ovaries which in turn call forth the characteristic cyclic changes.

Since this discovery several questions have arisen which are being studied in many clinics in this country and abroad.

The specific problem with which this paper is concerned is as follows: With an increase of anterior hypophysis hormone in amount a great many times the normal, the amount of hormone to be found in the gland upon removal should be greater than normal, or in other words, it should require smaller implants of anterior hypophysis of pregnancy to produce estrus in the infantile mouse, than of normal hypophysis. Although these great increases of anterior hypophysis hormone in the circulation of pregnancy in cattle had not yet been proved, they had been indirectly indicated. At any rate it was safe to assume that conditions in cattle are not directly opposite to those in human beings in such fundamental matters; and so, because of the difficulty at the time of obtaining human material, cattle hypophyses were used.

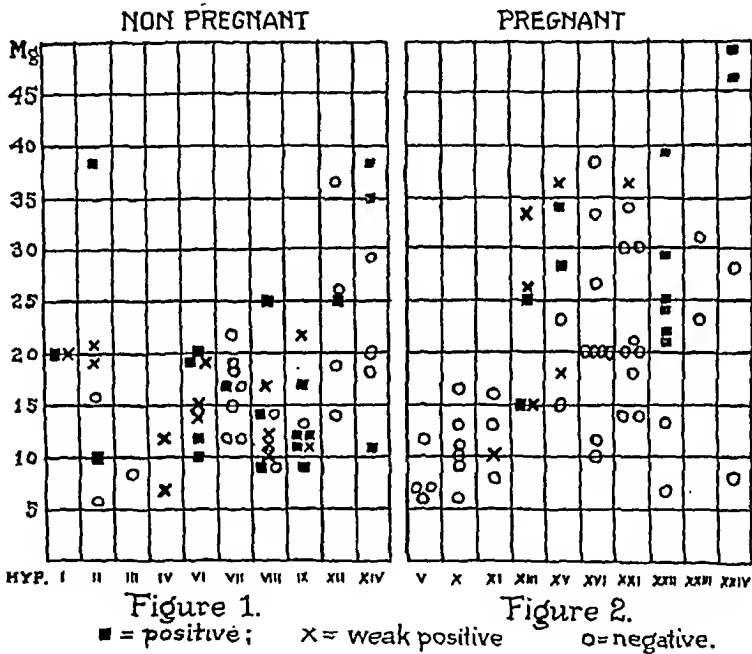
Immediately after slaughtering, the hypophyses were dissected out, the anterior lobes stripped of their capsules, and pieces cut out and weighed, ranging from 5 to 50 mg. A number of hypophyses both pregnant and normal were preserved on ice for twenty-four hours before implantation without causing any difference in

*Read by invitation at a meeting of the Chicago Gynecological Society, March 15, 1929.

the results. This finding is in accord with that of Zondek who has found that the hormones, both the female sex and the hypophysis, are preserved by refrigeration for eight days. These pieces were implanted into infantile female mice weighing less than 10 gm. (The size at adolescence is always more than 12 gm.) Vaginal smears were made according to Allen and Doisy's procedure twice daily for five days following the implantations. In a number of cases postmortem examinations were made on the mice after the estrus stage had been passed to check up on the findings.

The findings were divided into three groups:

1. The pure or definitely positive reactions in which the nonnucleated squamous epithelial cells so dominated the smear that practically no mucus or leucocytes were present. (According to Laqueur, 95 per cent pure.)



2. The weak positive reactions in which the squamous epithelial cells were present in the largest amounts, but accompanied by mucus and leucocytes, and occasionally nucleated epithelial cells. (The predominance of nucleated cells indicates the proestrus stage.)

3. The negative reactions in which the squamous epithelial cells were practically or totally absent.

The technic and the interpretations of readings were made identically, that is without any reference to the implants. When a reaction took place, the estrus stage was reached four days after the implantation, with the proestrus stage usually noticeable the day before. The results show considerable variations between the individual hypophyses examined. They also show quite variable reactions by the individual mice to the same hypophyses, which, of course, tends to cloud

the conception of an exact mouse unit. For these reasons quite a large number of experiments was made so as to get the averages from a sufficient series.

The summation of results was striking. Fig. 1 shows the results of implanting pieces of normal or nonpregnant hypophyses. It is difficult to state what the smallest amount would be, theoretically, which might still produce estrus, but a number of negatives appear to be present regardless of the size of the implants. Fig. 2 shows the results of implanting pregnant hypophyses. The large number of negative results especially in the range of small implants is readily apparent.

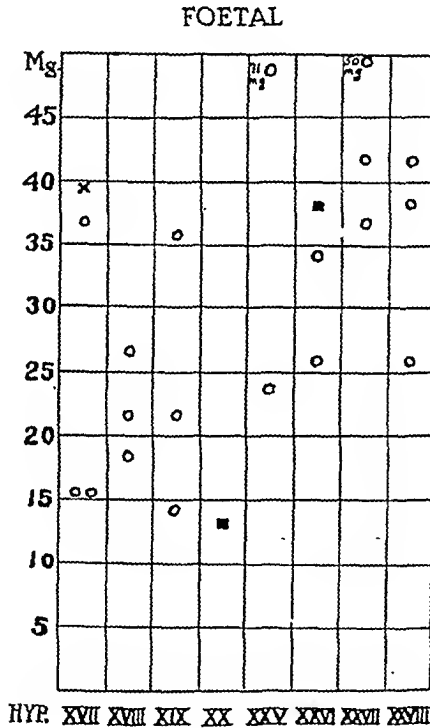


Fig. 3

This then is the opposite to what had been expected. The size at which the results of the pregnant and nonpregnant implants diverge is approximately 20 mg., and if this be arbitrarily considered, Table I can be formulated.

This shows at a glance that the hormone content of the nonpregnant hypophyses was found to be decidedly greater than that of the pregnant ones. In the group of large implants (more than 20 mg.) where there is a sufficient excess of hormone, the results are practically equal.

Fig. 3 shows the results of implanting fetal hypophyses (unborn calves). It is obvious that there is no large production of hormone in these glands; although the presence of an occasional positive reaction is in accordance with the findings of Schultze-Rhonhof, and Mahnert.

and Sigmund, who have demonstrated hormone production in the fetal hypophyses of quite a number of different animals.

TABLE I

WEIGHT OF IMPLANTS	NONPREGNANT				PREGNANT			
	POSITIVE	WEAK	NEGATIVE	TOTAL	POSITIVE	WEAK	NEGATIVE	TOTAL
0 to 20 mg.	15 35%	12 28%	16 37%	43	1 3%	3 9%	28 88%	32
More than 20 mg.	5 46%	2 18%	4 36%	11	11 42%	4 16%	11 42%	26

When we consider the immense increase of anterior hypophysis hormone in the circulation of pregnant women, and even though this has not yet been fully verified for the cow, it is difficult to believe that the hypophysis produces it all and that it is so rapidly absorbed into the circulation that the gland on examination, by this method at least, is relatively exhausted. It seems much more likely, then, that the source of this increase must be found elsewhere. This actually seems to be the case, as the so-called anterior hypophysis hormone has been found in the decidua by the same method of implantation. It is not at all impossible that the decidua taking up the production of the hormone relieves the hypophysis of the necessity of carrying on its function, and causes a state of reduced activity. A parallel to this is found in the large amount of female sex hormone in the later months of pregnancy while the hormone disappears from the corpus luteum of pregnancy. At the same time the sex hormone is actively and increasingly produced by the placenta.

CONCLUSIONS

It was attempted to show what relation exists between the hormone content of pregnant and nonpregnant anterior hypophyses, by the method of implantation into infantile female white mice.

It was found that the pregnant hypophyses were poorer in hormone than the nonpregnant ones; although the hormone content of the pregnant blood is vastly greater.

This is possibly explained by a reduced activity brought about by a vicarious hormone production in the decidua and is analogous to the disappearance of female sex hormone from the corpus luteum of pregnancy with the increase of hormone production by the placenta.

Similar experiments are now being started with human material, and the search for further sources of the so-called anterior hypophysis hormone will be continued.

I wish to express my gratitude to Professor Fraenkel of Breslau for his friendly interest and wish to thank his assistants, especially Dr. Fels, for their cooperation while I worked in their clinic.

(For discussion, see page 426.)

CECUM MOBILE*

BY ANDRE CROTTI, M.D., F.A.C.S., COLUMBUS, OHIO

(Chief of Staff, White Cross Hospital)

A GREAT many persons are operated upon for chronic appendicitis when in fact the appendix has nothing to do with the symptomatology: the primary cause of the symptom syndrome lies in the colon, especially the cecum. A great many cases of constipation and of gastrointestinal disturbance could be cured, or at least greatly helped if the pathologic condition of the colon, and especially of the cecum, were understood and properly dealt with. In operating these so-called "chronic appendices," one finds that in the great majority of instances the appendix looks absolutely innocuous: no thickening, no congestion, no adhesions: it is a normal appendix. In fact, I would say that a genuine "chronic appendix" is rather rare. Obviously enough, an appendix may go through several acute attacks that leave behind some inflammatory evidences in or around the organ, thus giving between the intervals the picture of a true chronic appendicitis. But the number of these cases when compared to the number of right iliac fossa complaints where the appendix is found normal, is very small.

And what about the left iliac fossa complaints that imitate to perfection the syndrome of the so-called chronic appendix?

In my early experience, the results of the surgical treatment of these chronic appendicitis when the appendix was found to all intents and purposes to be normal, were unsatisfactory. Patients came back complaining as much and sometimes more than before. The same was true in patients operated upon elsewhere. Similar observations were made by others: Curshmann, in 1894; Haussmann, in 1904; Wilms, in 1908; Klose, in 1909; Waugh, Coffey, Small, Quain, Gray, etc., and attention was called by them to abnormal pathologic conditions and positions of the colon and cecum, which they regarded as the primary cause of the syndrome complained of.

It is a fact that if one explores systematically the abdominal cavity in vivo, through a long enough paramedian incision (a small incision in these cases is no longer warranted), one will find the explanation for the symptoms complained of. There is a mechanical interference of the colon that may occur at four points, namely, in the right iliac fossa, at the hepatic flexure, at the splenic flexure, and in the left iliac fossa. From the anatomic standpoint these are the only four points where

*Read at the Forty-second Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Memphis, Tenn., September 16, 17, and 18, 1929.

such mechanical interference can take place. It is obvious that mechanical obstruction of the colon following inflammatory or malignant processes, inflammatory bands or adhesions, etc., are not considered in the discussion. I am speaking only of pathologic, anatomic, or developmental defects.

I for one do not think that ptosis of an abdominal viscus as such causes much symptomatology, unless the viscus is mechanically interfered with. We see every day a ptosed kidney, a ptosed colon, a ptosed stomach, yet no symptoms are complained of. Complaint begins only when the viscus is mechanically interfered with.

It is hardly possible to discuss the subject of colon and cecum mobile without going into the general subject of visceroptosis. This would lead into a too long discussion. I will say, however, that from all the information at hand, colon and cecum mobile and coloptosis are congenital, whereas, visceroptosis of the stomach, pylorus, liver, kidney, is acquired, and from the weight of evidence, general visceroptosis is the result of the colon and cecum mobile, and not the antecedent of it.

The etiologic relationship has been well explained by Waugh and Small. The right-sided colon being normally intimately associated with the kidney, liver, pyloric end of the stomach, gall bladder, and duodenum, when the colon is loose and mobile, one of the natural supports and means of fixation of these various organs is removed, hence, the tendency to ptosis. But that is not all. When the colon mobile is overloaded, it pulls these organs downward through their fibrous attachments, thus aggravating the situation more than ever. Furthermore, a chronically sagging colon puts the superior mesenteric artery on the stretch. When one remembers the normal anatomic relationship of the duodenum and superior mesenteric artery, one will then readily understand that the transverse portion of the duodenum becomes compressed, hence, dilatation of the duodenum and stomach.

Because of the persistence of embryonic features so frequently found about the colon and cecum, features that are responsible for so many of the complaints the physicians hear, it might be well to go over a few of the main points in the embryologic development of the intestine.

In the youngest embryo the intestinal canal is a simple tube, almost straight, fixed to the spine by a mesentery. This tube will later undergo changes which result in the formation of the stomach, small and large intestines; it has a great tendency to elongate and form loops. The first loop formed through elongation has the form of an "U"; it is called the "U" shaped loop (Fig. 1). This loop protrudes through the umbilicus which is still wide open. At this period, the intestine is consequently extraabdominal.

About the end of the first month, not very far from the pelvic end of this loop there appears a diverticulum located in the free border of the

posterior limb of this "U" shaped loop. This diverticulum is located on the left side of the abdomen: it is the one that is going to form the cecum. The gut that passes straight from this diverticulum is the large intestine; the gut that is located above the diverticulum is the small intestine. At this period the cecum is still extraabdominal. We shall call this its first transitional position.

Growth continues. The umbilicus contracts and closes, thus forcing the intestine into the abdominal cavity. The small intestine elongates and fills the middle of the abdominal cavity, the right side being occupied by the liver, which is very large and extends down to the crest of the ileum. The large intestine, which is quite straight, occupies the left side, the cecum being near and below the umbilicus; due to the closing of the umbilicus it has become intraabdominal. It occupies its second transitional position.

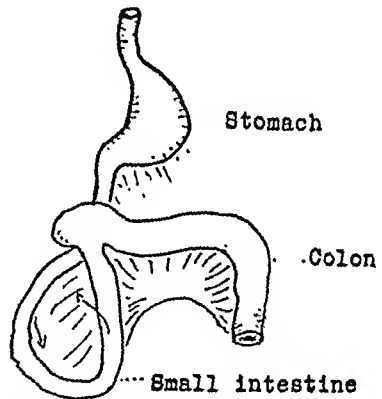
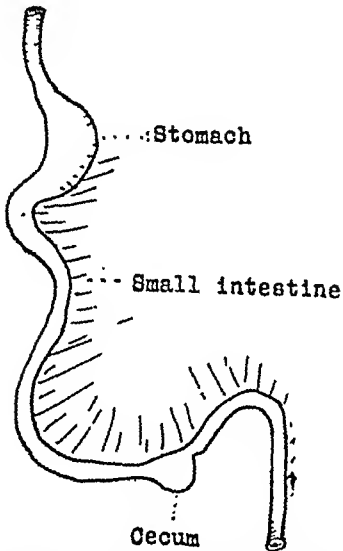


Fig. 1.—Note the diverticulum that is going to form the cecum.

Fig. 2.—Arrows indicate rotation of the small intestine.

During the first few months the cecum grows rapidly, except its tip end which retains its fetal size, thus forming the appendix. The appendix is consequently the undeveloped tip end of the cecum.

About the seventh month of fetal life, the cecum migrates upward into the left hypochondrium. In its ascent it comes to be very close to the cardiac end of the stomach. This is its third transitional position. The ascent is caused by the rapid increase in number of intestinal loops that push the colon and cecum upward.

By this time the liver has become much smaller and lies almost altogether in the right hypochondrium, leaving in the right side of the abdomen an empty space except for some loops of small intestine. The latter still keeps growing rapidly in length until it fills the abdomen, thus pushing the cecum and colon to the right, the ultimate result being that the cecum migrates toward, and finally comes to rest, below

the liver, near the gall bladder and kidneys, which position it will retain until birth. This is its fourth transitional position.

At the same time the ileum rotates, its distal end passing in front of the proximal end, and coming to rest in the lumbar and iliac regions, which the ascending colon will later occupy. (Fig. 2.)

Finally, the cecum begins its descent dragging along the colon and appendix; it finally comes to occupy its fifth and permanent position in the iliac fossa, where, if everything goes well, the primitive mesocolon will become firmly attached to the parietal peritoneum covering the lumbar and ileo-psoas muscles, thus anchoring the cecum and colon. During this descent the colon rotates about one-half circle on its long axis so as to enable the ileum to enter the gut on the left side without twisting.

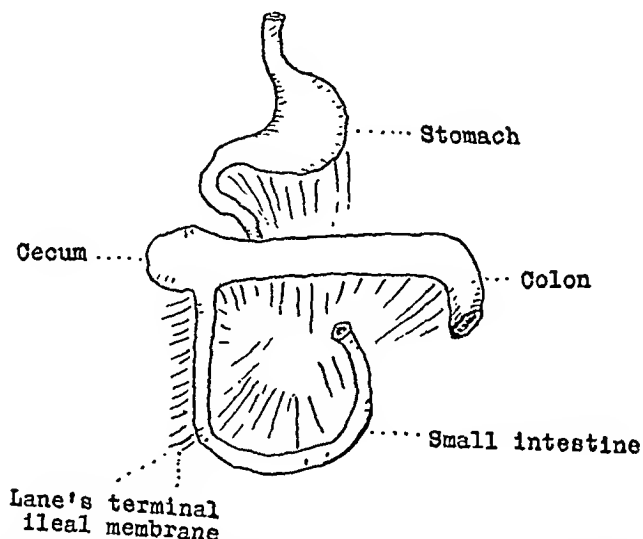


Fig. 3.—The cecum has not started its decent. Note the thick adhesions which bind the ileum to the iliac fossa, and which may result in the formation of Lane's terminal ileal membrane.

Many things may occur to interfere with this normal developmental process.

First, the cecum may remain unduly long in its resting place below the liver and contract unduly strong adhesions with the latter, the gall bladder, duodenum, posterior wall of the abdomen thus being prevented from descending into the iliac fossa. This will explain the "undescended cecum."

Then, too, during this unduly prolonged resting period of the cecum below the liver, that portion of the ileum that lies in the iliac fossa may become so adherent to the posterior abdominal wall and iliac fossa, that a strong fibrous membrane is formed between the ileum and the posterior abdominal wall. When, however, the cecum descends, it has to push the ileum inwardly so as to make its way down. In order to make its bed, the ileal adhesions must give; they become elongated, thus forming what is known as the Lane terminal ileal membrane

(Fig. 3). If, however, this membrane covering the raw surface of the posterior abdominal wall is too strong and does not give, it will prevent the mesocolon fusing with the parietal peritoneum. In consequence the cecum and ascending colon fail in contracting their natural adhesions with this wall and iliac fossa: in other words, a more or less long mesocolon remains persistent. Thus, we have the explanation of the colon and cecum mobile (Figs. 4 and 5).

Then again, as the cecum descends it pushes through and drags along the subhepatic adhesions thus contracted. If these adhesions are strong and thick they will persist in the form of a veil known as Jackson's membrane.

The remains of these membranes, Lane's and Jackson's, may be very strong or patchy, strong in places, thin or absent in others. In such instances we shall have bands that may interfere with the function of the colon.

Incomplete rotation of the colon during its descent will cause the ileum to enter the colon from behind instead of from the left side, thus

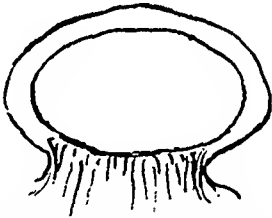


Fig. 4.—Normal attachment of colon to the posterior wall. The colon is anchored.

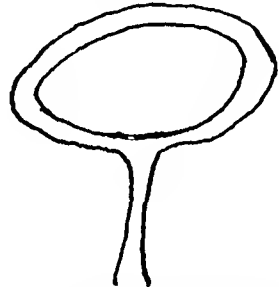


Fig. 5.—Abnormal mesocolon that allows a wide range of mobility. This condition is present in about 20 to 25 per cent of individuals.

resulting in interference with the physiologic function of the ileocecal opening.

There are a few instances, however, where the cecum does not slip down into the pelvis; it is held in the iliac fossa by some strong parietocolic fold. The ascending colon, however, is freely mobile because it possesses a long mesocolon. Under such conditions when overloaded the colon falls down over the cecum, producing a kink at the cecocolic junction.

And then again, during the descent of the cecum, the appendix may lag behind, caught by adhesions. We have then the retrocecal, the subhepatic appendix.

On the other hand, the descent of the cecum may not be checked in time; hyperdescent takes place and the cecum comes to rest in the pelvis. Although in adults the majority of pelvic ceca are acquired and due to some pathologic condition as we shall see later, nevertheless the congenital pelvic cecum due to hyperdescent exists, as shown by study of fetuses.

Finally, all sorts of malpositions of the cecum and colon may be observed. The cecum may be found at the umbilicus, in the upper, middle, or lower left abdomen. Thus the left-sided appendix may be accounted for. And also, the persistence of the mesocolon on the descending colon will be thus understood.

From the above, it follows that undescended cecum, colon, and cecum mobile, interfered function of the cecum and colon through fibrous bands, faulty anatomic position of the ileocecal junction, retrocecal appendix, and malpositions of the cecum and colon, are all due to the developmental anomalies; and unless these developmental anomalies are surgically dealt with, permanent relief of the complaints cannot be expected. Treatment of these conditions by medical means can be but palliative, but not curative.

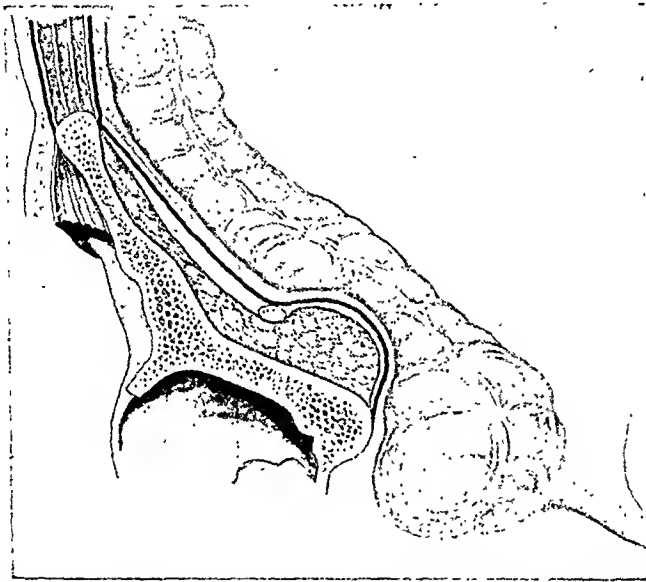


Fig. 6.—The cecum is lying in the pelvis. It is distended by gas and fecal matter. At the brim of the pelvis the colon is stretched and compressed, hence, pain simulating an acute attack of appendicitis.

How do these developmental anomalies interfere with a normal physical being? The sequence of the events is as follows: At first, the cecum and colon are mechanically interfered with, hence, colonic stasis. Interfered normal motility leads to abnormal secretion and abnormal absorption, hence, putrefaction of the colonic contents, hence, intestinal toxemia through faulty absorption of deleterious toxic products. Pain is easily explained, as we shall see later.

I am rather of the opinion that in the great majority of cases the colon mobile alone would cause little or no symptoms, were it not accompanied by a cecum mobile. It is the latter that becomes the most potent factor in the production of the gastrointestinal syndrome as the cecum seems to lead the physiologic pace for the rest of the colon.

It is true that the majority of authors seem to share the view that

because the colon is mobile it has lost its normal base, namely, its attachment to the posterior abdominal wall which acts as a fulcrum enabling the colon to forward its content. Under such conditions it becomes heavily loaded, wastes its energy in useless effort, and soon becomes exhausted.

I do not think that the loss of attachment of the colon to the posterior abdominal wall would lead to much complaint unless there is mechanical interference thereby produced. In other words, I feel that attached, or unattached, the colon will function more or less normally,

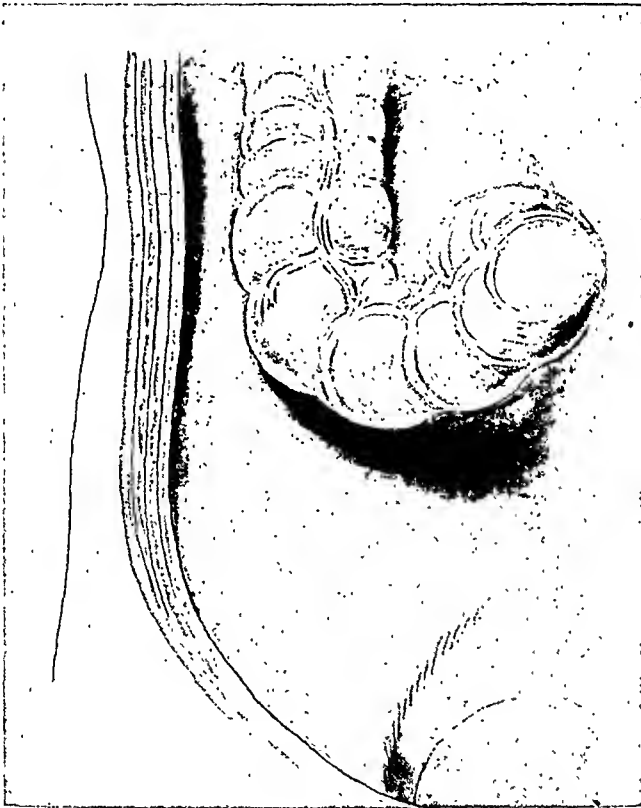


Fig. 7.—The cecum is lifted in order to expose the iliac fossa.

but that the unattachment will pave the way for mechanical troubles. I am reminded of the transverse colon that has no solid fulcrum and yet functions properly.

In my estimation the cecum mobile is most frequently the primary cause of the trouble. A glance at Fig. 6 will render the explanation quite clear. It shows the cecum hanging down in the pelvis. The weight of its contents pulls down, thus producing a constriction of the colon at the brim of the pelvis. Passive and active congestion take place at this point. If to that we add a certain amount of colitis due to cecal stasis plus putrefaction, we shall have the explanation of the pain complained of. Because of its location a diagnosis of acute ap-

pendix is erroneously made and appendectomy erroneously performed. The appendix, however, is found uninvolved.

Pain, furthermore, may be referred to the upper abdomen. It is caused by an undue traction of the ileocecal vessels, and most likely due to some reflex irritation of the solar plexus.

Posture has a pronounced effect upon the pain. Erect or sitting posture makes it worse. Decubitus dorsalis, especially right-sided decubitus, eases or relieves the pain altogether.

Besides the pain, the whole gamut of gastrointestinal and systemic disturbances can be readily understood. Stagnation at first causes

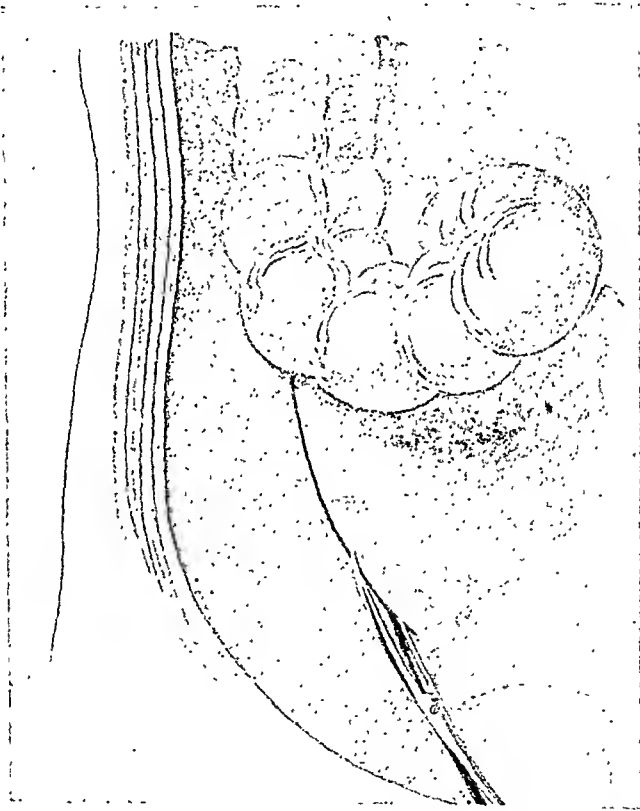


Fig. 8.—The parietal peritoneum is incised. The incision is pushed as far upward as is necessary. When colopexy is contemplated, the incision is swung around on the outer border of the colon.

constipation, but the subsequent irritation of the bowel due to putrefied content, will induce periods of diarrhea. In a few instances, however, daily bowel movements may be present and yet there is a retention of feces, much in the same manner as observed in bladder regurgitation.

Indigestion, nausea, even vomiting, though the latter is less frequent, are explained.

In a few instances, the colon and cecum mobile will simulate a gastric or duodenal ulcer to perfection: pain is localized in the epigas-

trium or the upper right hypochondrium; it is relieved by food, as duodenal ulcer. The most constant time of pain is from four o'clock in the afternoon, then again from midnight to 2 A.M. Exploration for ulcer is totally negative, but a mobile right colon is present. Colopexy plus cecopexy relieves the situation altogether.

Systemic disturbances, such as headaches, neuroses, sense of fatigue, sleeplessness, sallow tinge of skin, rheumatic pains, skin eruptions, dermatitis, etc., are quite common.

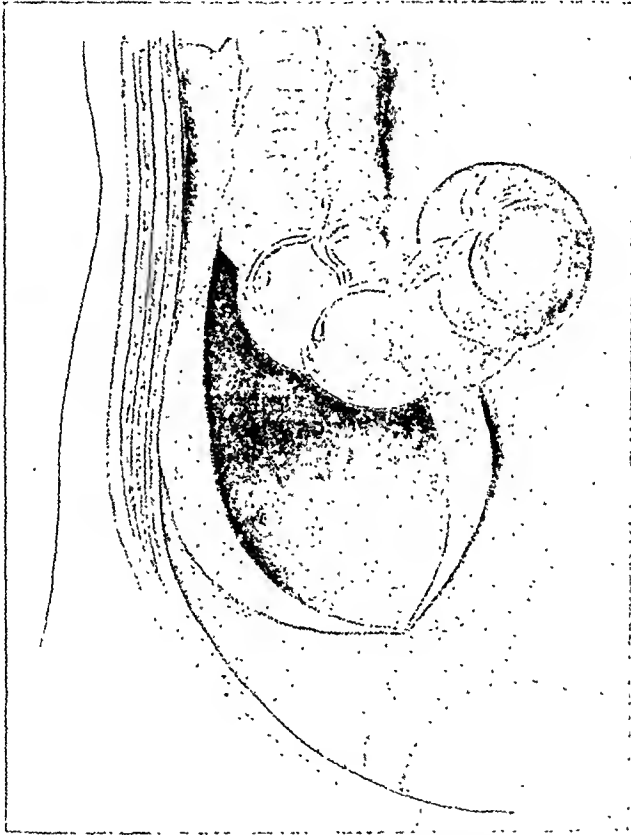


Fig. 9.—The peritoneal flaps are swung inwardly and outwardly so as to expose bare the iliac fossa. All fatty tissue is removed so as to assure direct contact of the colon with the lumbar and iliac muscles. The colon and cecum are then gently coaxed into the cavity thus made.

The best proof that this whole syndrome is of cecal origin is that medical means will temporarily remedy the situation, and that properly applied surgical measures will immensely improve or absolutely cure the patient.

Diagnosis ordinarily does not offer any difficulty. The history, the physical examination and x-ray findings will be most convincing. Palpation of the iliac fossa especially will give valuable information. By choking the colon in the lumbar region with the left hand (fingers in front, thumb behind) so as to imprison the gaseous contents of the cecum, one is readily able to outline the caput coli and to follow it

down into the pelvis. This maneuver is rendered easier by the relaxed and thinned abdominal walls that so frequently accompany the syndrome. In fact, the laxity and loss of tone of the abdominal muscular belt plays a very important part in the intensity of the symptoms, and ought to be given due consideration in the up-building treatment following operation.

The cecum is felt distended, rather firm, elastic, and frequently can be moved about. It is usually sensitive or even painful to pressure. Sometimes, it is quite hollow-like, tympanitic, gurgling on pressure; splashing is rare.

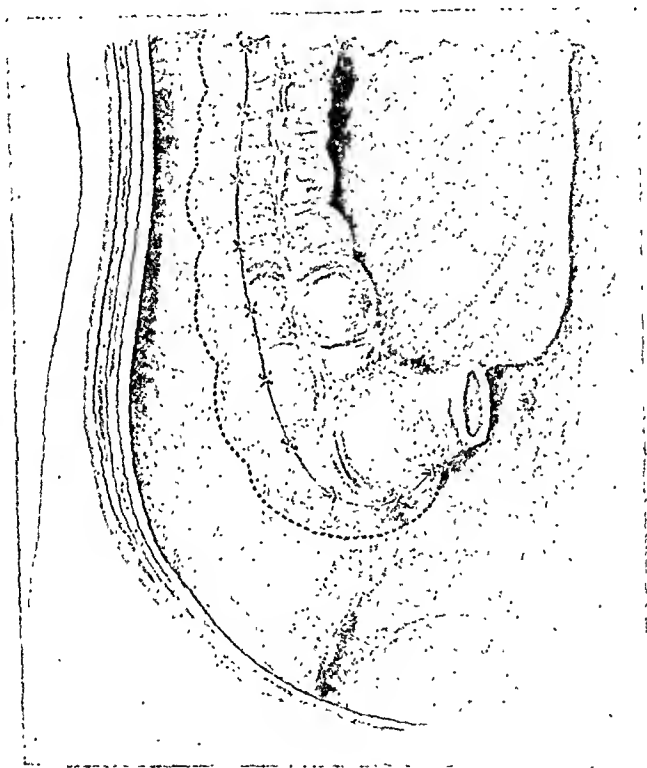


Fig. 10.—The parietal peritoneum is then sewed up to the colon and cecum so as to anchor it. Interrupted or running sutures taking place either on the cecum and colon itself, or on the anterior band.

When a definite dilatation and distention of the cecum and ascending colon are present, there is often observed a tympanitic distention of the central part of the abdomen, due to incompetency of the ileocecal valve.

X-rays are a valuable diagnostic adjunct. They enable the physician to visualize the size and position of the cecum, and what is more important, to determine its emptying time. In the floating cecum the bismuth may remain several days before it is passed along. When such is the case it is not uncommon to find bismuth residues in other portions of the colon, especially the transverse and descending colon.

This corroborates what I have said elsewhere, namely, that the caecum coli leads the pace in the motility of the large intestine, and when interfered with, the whole colon is interfered with.

Ordinarily, there is no muscular rigidity, no rise of temperature, no leucocytosis; the attack is not severe and subsides in a day or two.

An overloaded ascending colon mobile may cause a drag of the gastrohepatic omentum which may result in bending or obliterating the cystic duct and thus mimic gallstone colic, or it may affect the common duct and cause jaundice.

Another very frequent mistake is right-sided oophorosalpingitis and tender movable kidney.

The technic of operation is very simple, as illustrated in the accompanying pictures. No fatalities or complications occurred in my experience. The operation is well tolerated except for a feeling of fullness in the right iliac fossa that disappears as soon as the patient becomes accustomed to the sensation of having the cecum in its new but normal place. The results have been without exception excellent.

If the ascending colon is unusually long, one ought to guard carefully against the possibility of its telescoping after its replacement.

As the right kidney is frequently found ptosed and freely mobile, it is well to anchor it by a few stitches to the posterior abdominal wall.

So far I have spoken only of the cecum and ascending colon.

That, however, a mesocolon may be present in the descending colon, there is no doubt. Already, in 1885, after examining 100 subjects, Treves found a left mesocolon present in 36 cases. Under such conditions the descending colon sags down and becomes kinked at the brim of the pelvis.

The surgical technic is the same as for the right-sided colopexy.

I have come to believe that in view of the chronic invalidism and unbalanced nervous system that can be laid at the door of the developmental anomalies spoken of, one is warranted in undertaking such corrective measures as described above, especially in dealing with young individuals. Here the results will be far more satisfactory than in cases of long standing where colonic decompensation has affected not only the muscular frame of the colon but the normal physiology of the mucous membrane also. It is true that many persons with developmental defects may, and will, get along without discomfort, but sooner or later a break comes to the great majority of them, and when it does it is my firm belief that operative measures should be undertaken. I feel, furthermore, that when the abdomen is opened for some other purpose, colopexy or cecopexy ought to be performed as routinely, when indicated, as the appendix is routinely removed.

THE TREATMENT OF FIBROIDS*

BASED ON A SERIES OF 233 CASES

BY W. C. DANFORTH, B.S., M.D., F.A.C.S., AND R. M. GRIER, B.S., M.D.
EVANSTON, ILL.

(From the Department of Gynecology and Obstetrics, Evanston Hospital)

WE DO not apologize for bringing before you the subject of the treatment of fibroid tumors of the uterus. This condition is so frequent in the work of the gynecologic surgeon that frequent evaluation of methods and results is of value.

We desire briefly to report upon the work done in this field during the past five years in the gynecologic-obstetric service of the Evanston Hospital.

We are accustomed to divide our cases of uterine fibroids into three classes so far as methods of treatment are concerned: first, those which require no treatment; second, those which are irradiated; and third, those which are operated upon.

We see a considerable number of small fibroids which are wholly symptomless and for which nothing need be done. We believe, however, that in all cases in which the women are advised to have nothing done, that they should also be advised to return for observation at stated times in order that changes in size or shape may not occur unnoticed. They are asked also to return if increased loss of blood appears. A number of women who were advised to have nothing done when first seen were later either irradiated or operated upon because of changes discovered at later examinations. It is not to be assumed that the findings at the first examination will remain unchanged.

During the time covered by this report, 233 cases of uterine fibroids have been seen in which active treatment was indicated. Of this number irradiation was chosen in 57. Our choice of cases of fibroid tumors for irradiation is governed by conditions which have been set forth fully by a number of writers including the senior author, who has discussed it on two occasions. It is, however, so important that we take the liberty of briefly noting the indications, or rather the contraindications.

1. The size of the growth. We do not irradiate growths larger than a three months pregnancy, and during the last three years, have preferred to decrease rather than increase the size of growth subjected to this mode of treatment. We are aware of the excellent reports of Burnam who has treated a number of tumors larger than this, but we believe that larger growths are best managed by surgical

*Read at a meeting of the Chicago Gynecological Society, June 21, 1929.

methods. In this view we agree with a considerable number of gynecologists whose opinions have been expressed in published reports during the past few years.

2. Age. We do not irradiate in women under forty unless some condition exists which renders operation dangerous. Whatever the exact mechanism of the action of radium may be, all agree that ovarian activity is stopped by the dosage which is necessary for the control of bleeding from a fibroid, and in younger women this is not desirable. Hysteromyomectomy or myomectomy is to be preferred.

3. Adnexal inflammation, recent or remote, which may be stirred to activity by the instrumentation preceding the introduction of the radium, or by the action of the radium itself.

4. The presence of any neoplastic change in the ovaries.

5. Submucous growths which project far into the uterine cavity, or pedunculated growths.

The limitations imposed by these contraindications cause irradiation to be restricted to a rather small class of tumors. Within these limits we have had very satisfactory results, no one of the cases in this series has needed further attention. In a series of 187 cases of myopathic bleeding, or bleeding accompanying small fibroids, reported elsewhere, we had an incidence of failure of 4.5 per cent. Failure is taken to mean that one irradiation did not stop the bleeding.

The most important result of irradiation in our work has been the cessation of bleeding. In some cases the tumors have decreased somewhat in size, but in no case has the growth wholly disappeared, at least while the woman remained under our observation.

In only two cases have we made use of x-ray treatment. These both were in women who had tumors of considerable size and to neither of whom we wished to give even a brief anesthetic. One had a large aortic aneurysm and a marked myocarditis with a four plus Wassermann. The other had a chronic nephritis with a blood pressure of 200 over 110, and a myocarditis. X-ray treatment relieved the bleeding in both cases. We prefer, however, except in instances such as are illustrated by these cases, to make use of operation or radium.

Irradiation was employed in 57, or 24.5 per cent, of the total number of cases treated. The remainder of our patients were operated upon. Our operative treatment, with the exception of a few pedunculated growths presenting at the cervical opening or hanging into the vagina, has been by the abdominal route. The small pedunculated growths were not included in this report. The abdominal approach is easier, gives a far better exposure, and allows unexpected conditions to be dealt with with greater ease and safety than the vaginal route. The latter in any event is applicable today only when a small growth is present. In case of small tumors associated with prolapse vaginal operation may be useful.

The choice of procedure is either myomectomy or some form of hysterectomy. We have done myomectomy in only 4.3 per cent of our cases, a very much smaller percentage than has been reported from

some other sources. Our attitude in this may be conservative but has been influenced somewhat by the fact that many tumors not giving symptoms have been let alone. Our service combines gynecology and obstetrics, and our work is influenced somewhat by the fact that many of our patients are cared for later in the maternity. If the tumor is so situated that it would not cause trouble during pregnancy or interfere with labor, it is often let alone. In at least two cases cesarean section has been done at term because of tumors which would cause obstruction to labor on account of their size and position, but which caused no symptoms for periods of years later.

One woman passed through three pregnancies and labors in our obstetric ward service while her uterus contained several fibroids, one of fair size. She was later operated upon. The woman's health and the influence of the fibroid upon this and upon her ability to bear children should be considered in each case. A set rule should not be followed. Every year we carry through pregnancy and deliver a number of women with fibroids, and some of these have been delivered more than once. A few of them have ultimately been operated upon. A small fibroid in the upper part of the uterus does not preclude child-bearing.

Our myomectomies have been confined to cases in which the operation is quite simple. While admitting the force of the argument of those who perform it more frequently, we feel quite certain that the enthusiasm of some of the protagonists of the operation has caused it to be applied to cases which would have been better managed if the uterus had been removed. The removal of large numbers of growths, or the making of extensive wounds in the uterus leaves a damaged organ, and the convalescence is less satisfactory. It is best reserved for growths which may be removed easily and without deeply injuring the uterus. Within these limitations it is a useful procedure.

The most frequently performed operation in our series is the supra-cervical hysterectomy. We have followed with interest the discussion as to the merits of the total and subtotal hysterectomy. The strongest argument of the "totalists" has been the danger of the occurrence of carcinoma in the retained stump. We have not been greatly impressed by this danger. In our own experience, in the series here reported and in a considerable number of cases prior to the time covered by this report, we have seen but one case of carcinoma in the stump after subtotal hysterectomy. In this case almost certainly, we believe, a carcinoma was overlooked at the time of operation. In a series of 1114 supravaginal hysterectomies reported by Hochman from the Woman's Hospital of New York in 1924, carcinoma developed in the retained stump in 0.2 per cent. Clark and Block report a similar experience. It would seem, therefore, that the increased risk of the total operation would more than balance the slight risk of carcinoma in the retained

stump. Our practice, therefore, is to do the supracervical operation as a rule, reserving the total operation for cases in which notably diseased cervixes are found.

In addition to the somewhat increased risk of the total operation it also has the disadvantage of shortening the vagina. The support of the vaginal vault, also, cannot be as efficiently cared for in the absence of the cervical stump, to which the cut ends of the round and broad ligaments may be attached in those cases in which a tendency to sagging exists. In our own work we do not attach the round and broad ligaments to the cervical stump if much tension is needed to approximate them. Postoperative discomfort seems to be greater where tension exists. In many cases it is a useful procedure.

In the hands of expert pelvic surgeons the difference in the mortality of the two operations is inconsiderable. It must be remembered, however, that a very large number of these operations are done yearly by men whose surgical and gynecologic experience is small. In the hands of occasional operators the risk of the complete procedure is distinctly greater. Black, some years ago, estimated that the mortality of subtotal hysterectomy the country over was probably between 5 per cent and 6 per cent. The mortality in a well-organized, gynecologic service should not run over 1 per cent. It is probable that the difference in the mortality rate of the complete operation in skilled and unskilled hands would be at least as great. It is best, therefore, to consider the subtotal operation as the routine procedure. We believe, however, that our stand as to this has been perhaps too conservative. We have found it necessary to treat a few retained cervixes with the cautery for troublesome discharges. This may be avoided by attention to the cervix at the time of operation by cautery or plastic work if it appears desirable to retain it.

This report is based upon a series of 233 cases. Of these 57, or 24.5 per cent, were treated by irradiation and the remainder operated upon. Myomectomy was done in only 13 cases, or 5.8 per cent, of this series. We have, in addition to the cases presented and during the time covered by this report, removed a considerable number of small fibroids by shelling them out when discovered during the course of operations done for other reasons.

Subtotal hysterectomy has been done in all the remainder with the exception of 10 cases in which total hysterectomy was done.

Of the 233 cases 57 were irradiated and 176 operated upon. Total hysterectomy was done in 10 cases, or 4.3 per cent. Myomectomy was done in 13 cases, or 5.8 per cent. Subtotal hysterectomy was the procedure in the remainder. In the cases of subtotal hysterectomy the adnexa on both sides were preserved in 56 cases, or 24.1 per cent. One ovary was preserved in 50 women, or 21.1 per cent. If we add to the cases of complete and partial preservation of ovaries the cases of myo-

mectomy, in all of which the ovaries are preserved, it will be seen that one or both ovaries were preserved in 51 per cent. As will be seen in Table I the average age of cases operated upon, excluding those in which myomectomy only was done, was more than forty years. While the preservation of ovaries is not as important as in earlier life, our tendency is to be more and more conservative as to this. There is less postoperative discomfort caused by menopausal manifestations when some ovarian tissue remains.

TABLE I. GENERAL DATA

Total number of cases	233
Total number of deaths	1
Average age of:	
All cases treated	42.4 years
Operated	42.3 years
Irradiated	44.6 years
Uterus, tubes, and ovaries removed	43.6 years
Myomectomy only	39.8 years
Nullipara	75
Primipara	30
Multipara	90
Parity not given	32

In this series there was one death, apparently from pulmonary embolism. Autopsy was not permitted. Our mortality for the entire series is therefore 0.42 per cent. Excluding the irradiated cases, in which no death occurred, the mortality for the operated cases is 0.54 per cent. Our own experience, and that of other experienced operators, would seem to indicate that in skillful hands the risk of surgical treatment of fibroids has been reduced to a very low point. The factors which contribute to these results are proper anesthesia, avoidance of blood loss, and rapid and nontraumatic operating. The importance of anesthesia is so widely recognized today that extended discussion is unnecessary. Ether, with adequate relaxation of the patient is the most serviceable form of anesthesia. Trial of nitrous oxide and ethylenc for deep pelvic work shows that any advantage possessed by these agents is more than neutralized by the increased amount of trauma to the bowel by firm packs and by lengthened time of operation. Blood loss can nearly always be reduced to a small amount by accurate control of the uterine and ovarian arteries, which is ordinarily not difficult. Rapidity of work should be sought for but not at the expense of proper technic.

The avoidance of trauma is important in any abdominal work. We find it possible to dispense with laparotomy pads in the majority of our cases. They are needed in less than 20 per cent. Where packing seems necessary, the rubber dam is far better than the woven gauze pad, as it traumatizes the bowel much less. This has been the experience of a number of gynecologists, several of whom have reported

upon it. Gauze is only used when the escape of possibly infective material is feared, and then the gauze is placed over a rubber pad so that the bowel comes in contact with it but little if at all. Proper relaxation lessens the need for packs and for forcible retraction. A thirty minute operation with ether anesthesia, no pads and gentle handling, will as a rule give less postoperative discomfort than one of an hour with gas anesthesia accompanied by a greater use of force. These are matters of operating room organization and training.

TABLE II. SUMMARY, OPERATIONS AND IRRADIATIONS, 233 CASES

Irradiated	57—24.5%
Subtotal hysterectomy (adnexa not removed)	56—24.1%
Total hysterectomy	10— 4.3%
Myomectomy only	13— 5.8%
Subtotal hysterectomy plus both tubes and ovaries	47—20.2%
Subtotal hysterectomy plus partial removal of adnexa	50—21.1%

As to the relative merits of irradiation and operation we strongly believe that it is a gross error to regard these as methods which compete with one another. Rather, they should supplement one another. Both are methods which the gynecologist should have at his command. The choice of procedure should be made by one with a sufficient familiarity with gynecologic diagnosis and pathology to enable him to choose the treatment best adapted to the given case.

In our own experience, while a minority of cases respond excellently to irradiation, we find ourselves growing rather more conservative in its application rather than less so. Cases for irradiation should be carefully chosen with the indications as noted earlier in this report clearly in mind. A failure to exclude cases which are unsuited to irradiation will produce unfortunate results.

TABLE III. MORBIDITY

	NUMBER OF DAYS							TOTAL CASES
	NONE	1	2	3	4	5-10 INC.	10 OR MORE	
Total hysterectomy	2	0	1	4	1	1	0	9
Irradiation	57	0	0	0	0	0	0	57
Subtotal hysterectomy plus part or all of adnexa	86	35	17	12	6	9	2	167
Cases having a temperature of 100.4° or more at any time are included in the morbidity list.								

The incidence of morbidity in any series of cases depends upon what is assumed as the standard of morbidity. If we accept the most uncompromising standard, and include every case in which a rise of temperature to 100.4 degrees F. occurred at any time, the number of cases will be larger than if we only included those cases in which convalescence was really compromised. The number of cases in which the temperature at any time reached 100.4 degrees is shown in Table III.

Many of these had only a very brief rise of temperature and only a few of them were notably inconvenienced. In two cases phlebitis lengthened the convalescence. Only a small number of wound infections occurred. During the past year there were two such infections in cases of operations for fibroid tumors. Neither was serious.

The risk of the treatment of fibroids in well-organized services has been reduced to so low a level that one may hopefully look forward to the entire disappearance of mortality. Certainly institutions in whose wards or operators in whose hands mortality rates notably above those indicated in the reports to which we have referred or that which we show in the series here reported, should seriously consider whether their patients are receiving the care to which they are entitled. The great improvement even in the better institutions will be indicated by comparison of the figures here given with the mortality in the Johns Hopkins Hospital up to 1906, which is given by Kelly and Cullen as 5.75 per cent. The succeeding three years in the same institution showed a mortality of 1 per cent.

The present state of the surgery of fibroids, at least in experienced hands, is extremely satisfactory. While this is a matter of pride to those engaged in pelvic surgery it should not cause us to cease from the endeavor still further to improve our results.

CONCLUSIONS

1. The mortality in the treatment of fibroid tumors of the uterus today should be one per cent or less. A mortality rate materially higher than this may justifiably raise a question as to efficiency of management.

2. Operative treatment and irradiation are not competitive methods. One or the other should be chosen by intelligent discrimination after careful consideration of the individual case.

3. Supravaginal hysterectomy is the operation of choice in the great majority of cases. Myomectomy is of value in selected cases. Total hysterectomy is only occasionally needed.

4. The ovaries should be conserved whenever possible, especially in younger patients.

5. Convalescence is materially improved when operative trauma is slight.

636 CHURCH STREET.

(For discussion, see page 429.)

CISTERN PUNCTURE IN THE NEWBORN

BY L. HOWARD SMITH, M.D., PORTLAND, OREGON

(From the Department of Pediatrics, University of Oregon Medical School)

FROM time to time reports have appeared in the literature as to the results of lumbar punctures made on a series of newborn infants. (Sharp,¹ Sharp and Maclaire,^{2, 3, 4} Ulrich,⁵ Roberts,⁶ Levinson, Greengard and Lifvendahl,⁷ Munro⁸ and Glaser.⁹)

The advantages of obtaining cerebrospinal fluid by means of cistern puncture in comparison with lumbar puncture have been pointed out by Ayer,¹⁰ Kramer,¹¹ Wenk,¹² Janossy,¹³ Ebaugh,¹⁴ Peet,¹⁵ Pires and Povia¹⁶ and Stewart.¹⁷ Special reference to cistern puncture in the newborn is made by Levinson, Greengard and Lifvendahl,⁷ Dunham,¹⁸ and Ruh and Garvin.¹⁹

We are not inclined to view cistern puncture as an "easy" method of obtaining fluid, but one that holds distinct advantages. The technic is acquired only with reverence, care, and understanding. The frequency with which one encounters traumatic blood in lumbar puncture in the newborn makes it an undesirable method of obtaining cerebrospinal fluid for careful study. In over 240 cistern punctures we have encountered traumatic blood only twice.

The following is a report on a series of 190 cistern punctures done on newborn infants from thirty minutes to six days old. None of these babies showed any clinical evidence of birth injury, intracranial hemorrhage, or bleeding elsewhere in the body. They were all delivered under the same obstetric supervision.

The obstetric procedures have been carefully checked to determine, if possible, any relationship between the character of delivery, use of pituitrin for the induction of labor, Gwathmey anesthesia, etc., and the incidence of blood found in the cerebrospinal fluid of the baby.

The cistern fluid of 190 newborn babies was clear in 158 (83.1 per cent) and bloody in 32 (16.9 per cent). Microscopic examination of 159 fluids was made immediately after cistern puncture with the results shown in Table I. It will be seen that although 83.6 per cent of

TABLE I

CISTERN FLUID			
Clear	(133) - 83.6%	{ No. R.B.C. = 42 { Less than 150 R.B.C. per cm. = 53 { Bet. 150 and 500 R.B.C. = 38	- - - - 26.5% } 117 - - 73.5%
Turbid	(26) - 16.4%	{ 1500 to 4000 R.B.C. per cm. = 10 { Over 4000 = 16	

(The cistern fluid becomes turbid so that macroscopic examination reveals the presence of blood, when the red blood cells reach a count of 1500 or more per c.m. A frankly bloody fluid will contain about 4000 or more red blood cells per c.m.)

the cistern fluids were clear and 16.4 per cent bloody, microscopically only slightly more than one-fourth of the fluids were free from blood. Glaser⁹ states, "the presence of red blood cells in microscopic numbers in the cerebrospinal fluids of premature infants during the early days of life is so common that it may be considered as a physiologic phenomenon."

The presence of microscopic blood in a clear cistern fluid we believe to be inconsequential, as even the bloody fluids on repeated tap cleared up completely within four days postpartum without the infant showing any symptoms of intracranial hemorrhage.

The truly deciding factor as to whether blood will be found in a cerebrospinal fluid seems to be how young the baby is when the cistern is punctured. Of the 131 infants receiving their initial punctures in the first twenty-four hours after birth, 24.5 per cent had bloody cistern flu-

TABLE II

AGE OF INFANT AT TIME OF INITIAL PUNCTURE		CISTERN FLUID	
30 minutes to 6 hours (19)	- - - - -	Clear	15 - 79.0%
		Bloody	4 - 21.0%
6 hours to 12 hours (35)	- - - - -	Clear	26 - 74.2%
		Bloody	9 - 25.8%
12 hours to 24 hours (77)	- - - - -	Clear	64 - 73.1%
		Bloody	13 - 26.9%
24 hours to 48 hours (27)	- - - - -	Clear	24 - 88.8%
		Bloody	3 - 11.2%
2 days to 3 days (18)	- - - - -	Clear	15 - 83.3%
		Bloody	3 - 16.7%
3 days to 4 days (6)	- - - - -	Clear	6 - 100.0%
		Bloody	0 - 0.0%
4 days to 5 days (5)	- - - - -	Clear	5 - 100.0%
		Bloody	0 - 0.0%
5 days to 6 days (3)	- - - - -	Clear	3 - 100.0%
		Bloody	0 - 0.0%

ids; only 13.9 per cent of the fluids were bloody in the 45 infants punctured from one to three days old. No baby over three days old showed blood on the first puncture. All infants with bloody fluids were subsequently again punctured, and a small quantity of fluid (1 to 2 c.c.) withdrawn, to determine when the fluid became clear. This clearing up invariably took place within two to four days.

The color of the clear cistern fluids was noted in 157 cases. In 98 (62.4 per cent) the fluid was yellowish, while in 59 (37.6 per cent) it was colorless. This is similar to the findings of Levinson, Greengard and Lifvendahl,⁷ who encountered 60 yellow fluids in a series of 100 newborns.

The exact cause of the yellow tinge to the cerebrospinal fluid of the newborn has not been fully determined. In ten cases where persistence of this yellowish color was ascertained by subsequent punctures, it was found that the fluid became colorless in from seven to fourteen

days after birth. This yellow color is apparently not determined or influenced by the presence of small amounts of blood in the cerebrospinal fluid, as those infants with frank blood in their cistern fluids continued to have a yellowish fluid not longer than those with clear fluids at birth.

The presence of jaundice in the baby and the yellow color of the cistern fluid appeared to have no relationship to one another. In Table III it will be seen that of 24 jaundiced babies with clear cistern fluids, 15 (62.0 per cent) had a yellowish and 9 (38 per cent) a colorless fluid. Of 57 babies without jaundice, 35 (61.4 per cent) showed a yellow and 22 (38.8 per cent) a colorless fluid. This is the same percentage of yellow fluids seen in the entire series.

Deluca²⁰ has called attention to the fact that jaundice of the newborn may be the result of intracranial hemorrhage. In 123 cases where

TABLE III

CISTERN FLUID					
Clear = (157) -	Jaundice (24)	Colorless	= 9	= 38.0%	
		Yellow	= 15	= 62.0%	
	No jaundice (57)	Colorless	= 22	= 38.8%	
		Yellow	= 35	= 61.4%	

the presence or absence of jaundice was carefully noted, it was found that of the 50 babies who were jaundiced, 41 (82 per cent) had no blood in the cistern fluid while 19 (38 per cent) showed a bloody fluid. Of the 73 babies without jaundice, 61 (83.5 per cent) had clear and 12 (16.5 per cent) bloody cistern fluids.

For estimating the pressure of the cerebrospinal fluid, the method of cistern puncture is superior to the lumbar since the former requires less manipulation to hold the baby still and thus certainly causes less struggling and crying of the baby.

At first careful readings were recorded with a manometer, but these subsequently were discontinued and the pressure simply estimated as increased, normal, or decreased. None of these cases showed any clinical evidence of intracranial injury. All punctures were made by the author and error of different operators' estimations eliminated. The results are shown in Table IV. The greatest percentage of bloody fluids was found in the group with decreased cistern pressure.

The Wassermann reactions of maternal and cord bloods were recorded in 107 cases. The two positive Wassermann reactions were found in the cord blood of newborn infants who had no blood in their cistern fluids. The other 105 babies with negative reactions showed the average incidence of bloody cistern fluids, 85 (80.9 per cent) being clear and 20 (19.1 per cent) bloody.

Since all these babies were born under the same general obstetric management with careful recording of procedures, they offered a good

TABLE IV

CISTERN PRESSURE		CISTERN FLUID	
Decreased (11)	- - - - -	Clear -	6 - 54.5%
		Bloody -	5 - 45.5%
Normal (133)	- - - - -	Clear -	115 - 86.4%
		Bloody -	18 - 13.6%
Increased (15)	- - - - -	Clear -	12 - 80.0%
		Bloody -	3 - 20.0%

opportunity to study the possible relationship of the presence of blood in the cerebrospinal fluid to the duration and character of labor, etc. Of 62 infants of primiparous mothers 50 (80.6 per cent) had clear and 12 (19.4 per cent) bloody cistern fluids. Of 120 infants of multiparous mothers, 102 (85.0 per cent) had clear cistern fluids while 18 (15 per cent) had bloody cistern fluids. One multipara in this series gave birth to her sixteenth baby after an extremely easy delivery. The cistern fluid of this newborn showed 450 red blood cells per cm.

TABLE V

CHARACTER OF LABOR		CISTERN FLUID	
Spontaneous (100)	- - - - -	Clear -	89 - 89.0%
		Bloody -	11 - 11.0%
Low forceps (50)	- - - - -	Clear -	38 - 76.0%
		Bloody -	12 - 24.0%
Breech extraction (5)	- - - - -	Clear -	3 - 60.0%
		Bloody -	2 - 40.0%
Cesarean (3)	- - - - -	Clear -	3 - 100.0%
		Bloody -	0 - 0.0%

The relations of the character of the labor to the presence of blood in the cistern fluid of the newborn are shown in Table V. It will be seen in this series that the greatest percentage of bloody fluids occurred in the breech extractions, next low forceps deliveries, and still less in those born spontaneously. The three babies born by cesarean section all showed clear cistern fluids.

Yagi,²¹ reporting a series of intracranial hemorrhages in the newborn, states that the duration of labor apparently was not an etiologic factor of great moment. Table VI shows the relation between the presence of blood in the cerebrospinal fluid and the number of hours of

TABLE VI

TOTAL HOURS OF LABOR		CISTERN FLUID	
Less than 6 hours (53)	- - - - -	Clear -	48 - 90.5%
		Bloody -	5 - 9.5%
6 hours to 12 hours (40)	- - - - -	Clear -	30 - 75.0%
		Bloody -	10 - 25.0%
12 hours to 24 hours (43)	- - - - -	Clear -	37 - 86.0%
		Bloody -	6 - 14.0%
Over 24 hours (17)	- - - - -	Clear -	13 - 76.4%
		Bloody -	4 - 23.6%

labor. Some of the longest labors showed no blood in the cistern fluid (i.e., one labor of ninety hours in which the cistern fluid was clear) while after some of the shortest labors cistern puncture revealed the presence of blood. The converse of this was also true, that after one of the long labors the baby showed a bloody fluid while in a great many of the short labors the cistern fluid was clear.

In Table VII, 72 cases are analyzed as to the length of first and second stages of labor in relation to the presence of blood in the cistern fluid. It would appear from this small series that the length of the

TABLE VII. ANALYSIS OF 72 CASES AS TO THE LENGTH OF FIRST AND SECOND STAGES OF LABOR

HOURS OF FIRST STAGE LABOR		CISTERN FLUID	
Less than 6 hours	(28)	} Clear	- 25 - 89.2%
		} Bloody	- 3 - 10.8%
6 hours to 12 hours	(18)	} Clear	- 13 - 72.2%
		} Bloody	- 5 - 27.8%
12 hours to 24 hours	(21)	} Clear	- 18 - 85.7%
		} Bloody	- 3 - 14.3%
Over 24 hours	(5)	} Clear	- 2 - 40.0%
		} Bloody	- 3 - 60.0%
HOURS OF SECOND STAGE LABOR		CISTERN FLUID	
Less than 30 minutes	(26)	} Clear	- 21 - 80.7%
		} Bloody	- 5 - 19.3%
30 minutes to 1 hour	(24)	} Clear	- 20 - 83.3%
		} Bloody	- 4 - 16.7%
1 hour to 2 hours	(15)	} Clear	- 12 - 80.0%
		} Bloody	- 3 - 20.0%
2 hours to 8 hours	(7)	} Clear	- 5 - 71.4%
		} Bloody	- 2 - 28.6%

first stage of labor is a greater etiologic factor in the production of bloody cistern fluids than the second stage.

The results after use of the Gwathmey method of labor anesthesia are shown in Table VIII. There was a definite increase of bloody fluids in the cases where the Gwathmey method was employed.

In a series of 155 deliveries, in 23 cases in which labor was induced by the use of pituitrin, the incidence of blood in the cerebrospinal fluid was somewhat increased over those not induced. There was a definite reason for induction of labor in each instance, and the amount of pituitrin administered was small.

One is impressed with the fact that although the character or length of labor, its artificial induction or Gwathmey's anesthesia have some

TABLE VIII

LABOR ANESTHESIA		CISTERN FLUID	
Gwathmey	(48)	} Clear	- 37 - 77.0%
		} Bloody	- 11 - 23.0%
No Gwathmey	(84)	} Clear	- 91 - 92.3%
		} Bloody	- 13 - 7.7%

influence on the presence of blood in the cerebrospinal fluid, the extra-uterine age of the infant represents the most important single factor which determines the finding of blood in the cistern fluid of newborn babies showing no clinical symptoms of intracranial injury or evidence of bleeding elsewhere. It would appear that at least one-fourth of newborn infants delivered under average conservative obstetric routine have some blood in the cerebrospinal fluid immediately after birth, but that this blood is very quickly absorbed and, even when present in considerable amounts disappears within the first few days of life.

TABLE IX

USE OF PITUITRIN		CISTERN FLUID	
Labor induced (23)	- - - - -	Clear	18 - 78.2%
		Bloody	5 - 21.8%
Not induced (132)	- - - - -	Clear	112 - 84.9%
		Bloody	20 - 15.1%

We are inclined to believe that the pediatricist has been rather hasty in condemning the obstetrician for the presence of blood in the cerebrospinal fluid of the newborn. In the average case of childbirth with ordinary conservative obstetric interference, the presence or absence of blood in the cistern fluid is probably dependent on factors which predispose all newborn infants to bleed easily. The fact that in repeated taps on the same infants, blood disappears, proves in itself that the clear blood or any red cells present in the first tap cannot be ascribed to accidental injury and thus interpreted as contamination.

When one recovers a bloody cerebrospinal fluid in a newborn infant, he has merely discovered that the cerebrospinal fluid is bloody without throwing any definite light on intracranial injury. It would appear, however, that the results of these investigations prove the existence of a "physiologic intracranial damage" incident to labor as pointed out by Ehrenfest.²²

This report is not concerned with pathologic cases, with infants offering clinical signs and symptoms of intracranial injury, but for them cistern puncture represents the method of choice for obtaining cerebrospinal fluid for study. Because these infants are more or less in shock, a procedure which can be done in less time and with less manipulation of the baby than lumbar puncture, certainly is preferable.

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MEDICAL ARTS BUILDING.

Belmonte, Demetrio: Activities in Maternity and Child Welfare Work in the Province of Cebu. J. Philippine Islands M. A. 9: 56, 1929.

The province of Cebu can be considered as a model province in maternity and child welfare work in the whole Archipelago, owing to its outstanding activities in health matters, particularly with regard to the protection of its infant population, which recorded a total of 38,816 births in 1926, and to the great number of puericulture centers established in its different towns. These puericulture centers, organized in accordance with existing provisions of law, have for their purposes (1) to combat effectively infant mortality in the localities wherein they are established; (2) to promote the well-being and health of the children; and (3) to guide and to keep well informed the prospective mothers in matters pertaining to confinement.

The development of the work on maternity and child hygiene has increased steadily, and has given very gratifying results.

Nurses and midwives have played an important rôle in the reduction of infant mortality. They have shown unusual courage in attending delivery cases in far-away barrios and distant places. The demand nowadays for the services of licensed midwives, in place of the ignorant, unlicensed ones, has shown that the people are gradually realizing the need of better safeguards for the care of expectant and parturient mothers, as well as of their babies.

C. O. MALAND.

AN ANALYSIS OF OPERATIVE RESULTS IN 1066 CASES OF SALPINGITIS*

(From the Service of the Woman's Hospital, New York City)

BY ALBERT H. ALDRIDGE, M.D., F.A.C.S., NEW YORK, N. Y.
(Junior Attending Surgeon)

IT HAS been estimated by a well-known writer on the subject of salpingitis that 75 per cent of invalidism in women arises from pelvic inflammation. From a study of the records of the Woman's Hospital, I have found that, as a result of tissue destruction from inflammation, one or both fallopian tubes are removed in approximately 25 per cent of the patients who have laparotomies for gynecologic conditions.

If we review the great mass of literature which has been written on this subject, we will find that it is eventually focused on two points:

- First: The nonoperative treatment of the patient who has a pelvic infection.
- Second: The choice of a safe time for operation on those patients in whom the infection has not been arrested nor the symptoms relieved by palliative treatment.

It is on this second point, the choice of a safe time for operation, that we find a wide variation of opinion. On the one hand we have the well-known conservative teaching of Simpson. He recommends that the patient must be allowed to recover from her acute illness, that she must not have temperature above normal a single time for at least three weeks, even after bimanual examination, and that the inflammatory exudate about the focus of infection must have been completely absorbed.

We also find the very conservative opinion of Curtis, who believes that we should delay operation as long as possible and that by so doing it will be necessary to operate on only about 15 per cent of patients who have had salpingitis. He recommends operation only, as he puts it, for the "sequelae of infection," and not for the infection itself. In other words, he believes that operations should be directed at reconstruction of tissue laid waste by disease and not at stamping out the disease itself.

On the other hand, we find in fairly recent articles the most radical views by men who have had much experience in the surgical treatment of this condition.

For instance, in an article by a well-known American surgeon we find the following statement, "Personally I have never seen the bad

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results reported in not delaying operation for the acute pus tube any more than I have for the acute appendix cases or ruptured tubal pregnancies, and heartily condemn delay and applaud early action of the surgical variety."

An eminent English surgeon states that for a great many years he has been an advocate of operating upon all cases of salpingitis at the earliest possible moment and that during the last twenty years has had only one death in a large number of operations for this condition.

In general, I believe that there has been a tendency to become more and more conservative in the treatment of pelvic infections and to avoid laparotomy whenever possible. Various factors have influenced gynecologists in adopting this conservative policy.

As the result of comparatively recent studies, the bacteriology of pelvic infections is better understood. Curtis, in reporting his studies of the bacteriology of salpingitis, concludes that tubes infected with the gonococcus become sterile about fifteen days after the fever and leucocytosis have subsided, and if symptoms reappear at a later time, they are due to reinfection and not to an exacerbation of the original infection. Streptococcic salpingitis presents an entirely different problem. A history of abortion, of puerperal infection, or of instrumentation with infection, gives the clue as to this type of infection. In these cases he has found that the bacteria are usually viable in the tissues for at least six months and not infrequently two years.

From his work he further concludes that secondary infection of the tubes after a gonococcus infection is infrequent, and that for reasons noted above gonorrhoeal salpingitis is a self-limited disease. If reinfection can be avoided in the patients who have gonorrhoeal salpingitis, a clinical cure without operation can be expected even in the cases with more than one attack, in all but about 15 per cent. In other words, if patients who have gonorrhoeal salpingitis have proper conservative treatment, only 15 per cent will ultimately need operation. In order to avoid operation on patients with active streptococcic infection in the tubes, he waits for two years from the time of the infection.

A high incidence of mortality and morbidity has been found to accompany operations in the presence of active infection. Furthermore, operation in the presence of active infection has been found to be radical in too high a percentage of cases. Protein therapy and physical therapeutic measures, especially diathermy, have been added to our previous methods of palliative treatment. We have had no experience with the latter method at the Woman's Hospital but good results from its use are claimed by some.

In case operation seems necessary a recent laboratory method, sedimentation time, has been found of value in detecting the existence of active infection which may make the proposed operation a dangerous

one. The surgeon is thereby warned to delay until a safe time presents itself.

This analysis of the records of 1,066 patients operated upon in the wards of the Woman's Hospital is submitted with the hope that it may add something to our knowledge of the dangers of operation in salpingitis, one of the most frequent and important gynecologic conditions.

The series which I have studied includes only patients operated upon in the wards of the Woman's Hospital from 1920 to 1927, a period of seven years. All of these patients had laparotomies for gynecologic conditions. All had either an acute or a chronic salpingitis alone, or associated with other pelvic pathology. Furthermore, the series includes only patients in whom a diagnosis of salpingitis was made by microscopic study of tissue removed at operation. It is of interest to note that these patients were operated upon by 29 surgeons who are specializing in the practice of gynecology and obstetrics.

CLASSIFICATION OF CASES

From the microscopic study of tissue removed at operation, the cases were divided into two groups according to whether or not the tissue removed showed evidence of existing active inflammation at the time of operation. In other words, the cases were classified as active or inactive.

Tables I and II show the types of cases which fell into each group.

TABLE I. CLASSIFICATION OF ACTIVE CASES

TYPE OF PATHOLOGY	NO. OF CASES
Pyosalpinx	71
Tuboovarian abscess	55
Subacute salpingitis	31
Acute salpingitis	28
Tuberculous salpingitis	3
Total	188

TABLE II. CLASSIFICATION OF INACTIVE CASES

TYPE OF PATHOLOGY	NO. OF CASES
Chronic salpingitis	376
Hydrosalpinx	76
Pseudocystic salpingitis	14
Haematosalpinx	10
Perisalpingitis	10
Tuberculous salpingitis	8
Chronic salpingitis and myomas	384
Total	878

I have implied that a conservative policy is followed at the Woman's Hospital. You may wonder, therefore, that in the series that I am reporting, 188 cases, more than one-fifth, showed active inflammation

in the tissue removed at operation. In order to obtain a sufficient series of active cases the study was purposely carried back to the days when the policy, although conservative, was not as decidedly so as at present.

It is of interest to note that in this series of 188 cases which were operated upon in the presence of active inflammation, only 20 per cent were diagnosed and intentionally operated upon for acute conditions. Only 5 per cent of the entire series had fever at the time of operation. A further examination of the records of these patients shows that 45 per cent were mistaken for chronic adnexal disease; 20 per cent were mistaken for acute pelvic conditions such as ectopic pregnancies or ovarian cysts with twisted pedicles, and the remaining 15 per cent had acute inflammation at the time of operation although it had not been discovered in the preoperative study of these cases.

The records of all the microscopically active cases in the series were carefully examined to determine whether they also had any clinical evidence of existing active inflammation during the period of preoperative observation in the hospital. Cases were considered active or inactive according to the standards noted in Table III.

TABLE III. STANDARDS FOR CLASSIFICATION OF INACTIVE CASES FROM THE CLINICAL STANDPOINT DURING PREOPERATIVE PERIOD OF OBSERVATION IN HOSPITAL

White blood count never reached	12,000
Temperature readings were never above	99.6°
Sedimentation time was never below	60 minutes

Of the 188 microscopically active cases, only 99 showed evidence of existing active inflammation when studied clinically. The microscopically active cases were therefore divided into two groups:

1. Clinically and microscopically active cases.
2. Microscopically active but clinically inactive cases.

The sedimentation time test was not generally used at the Woman's Hospital at the time that this series was under treatment, that is, up to 1927. Undoubtedly the presence of active inflammation might have been detected by its use in cases which failed to show it by other clinical diagnostic methods.

CHARACTER OF OPERATION

Operations were classified as conservative or radical, according to how much tissue was removed at operation. If enough tissue was left so that the patient had a chance for a future pregnancy, the operation was classified as a conservative one.

In studying this particular phase of the subject, cases operated upon for salpingitis associated with fibroids were omitted. These were ex-

cluded for the obvious reason that the surgical treatment of fibroids alone must be radical in a high percentage of cases.

Table IV shows a summary of the character of operations adopted in cases in which the infection was still active at the time of operation as compared to those in which the inflammatory process had become chronic or had healed.

TABLE IV. COMPARATIVE STUDY OF THE CONSERVATION OF TISSUE IN THE VARIOUS TYPES OF CASES

TYPE OF CASE	NO. OF CASES OPERATED ON (MYOMA CASES EXCLUDED)	NUMBER OF CONSERVATIVE OPERATIONS	PER CENT
Microscopically and clinically active	76	30	39.4
Microscopically active but clinically inactive	63	26	41.2
Chronic inactive	486	246	50.6

MORBIDITY

Table V shows the incidence of morbidity in the various types of cases which were operated upon for salpingitis. Faulty wound union was the most common cause of postoperative morbidity.

TABLE V. POSTOPERATIVE MORBIDITY

TYPE OF CASE	NO. OF CASES	COMPLICATIONS		COMPLICATIONS INCLUDING WOUND INFECTIONS	
		NUMBER	PER CENT	NUMBER	PER CENT
Microscopically and clinically active	99	33	33.3	52	52.5
Microscopically active but clinically inactive	89	13	14.6	27	30.3
Chronic inactive	878	101	11.5	159	18.1

Tables VI and VII give detailed lists of the postoperative complications which in addition to wound infections were responsible for the incidence of morbidity in the two classes of cases, active and inactive.

TABLE VI. ACTIVE CASES—POSTOPERATIVE COMPLICATIONS

	NO. OF CASES
Peritonitis	10
Urinary infection	8
Wound sinuses	8
Shock	6
Pulmonary infection	4
Septicemia	3
Pelvic cellulitis	2
Wound opened (resutured)	1
Abscess of abdominal wall	1
Tonsillitis	1
Fecal fistula through wound	1
Myocarditis (death)	1
Total	46

TABLE VII. INACTIVE CASES—POSTOPERATIVE COMPLICATIONS

	NO. OF CASES
Infections of urinary tract	27
Pelvic inflammation	14
Peritonitis	13
Respiratory infections (pneumonia 3 cases)	11
Thrombophlebitis	8
Shock	6
Pulmonary embolism (3 deaths)	4
Tonsillitis	3
Prolonged fever (cause ?)	3
Postoperative ileus	2
Parotitis	2
Hemorrhage from cervix	2
Malaria	1
Psychosis	1
Acute dilatation of stomach	1
Hematoma of wound	1
Diabetes (coma, death)	1
Intestinal obstruction	1
Total	101

DRAINAGE OF THE PERITONEAL CAVITY

It is recognized that opinions as to the necessity for drainage of the peritoneal cavity following operation for pelvic infection vary considerably with different surgeons and consequently the percentage of cases drained also varies.

The best method of drainage, that is, whether it should be through the abdominal incision or through the vagina, is also a matter of choice by the individual surgeon. As I pointed out above, this series represents a group of 1,066 cases operated upon by 29 surgeons. Therefore, the incidence of drainage as shown in Table VIII should represent an average opinion on this point in technic.

TABLE VIII. INCIDENCE OF DRAINAGE OF PERITONEAL CAVITY BY THE VARIOUS ROUTES

TYPE OF CASE	CASES NO. OF	VAGINAL		ABDOMINAL		VAGINAL AND ABDOMINAL	
		NUMBER DRAINED	PER CENT	NUMBER DRAINED	PER CENT	NUMBER DRAINED	PER CENT
Microscopically and clinically active	99	29	29.2	30	30.3	6	6.0
Microscopically active but clinically inactive	89	17	18.9	9	11.1	3	3.3
Chronic inactive	878	43	4.8	52	5.9	9	1.0

WOUND INFECTION

Wound infection is the most important factor which contributes to the high incidence of morbidity in operations for pelvic infection. Defective wound healing results in prolonged hospitalization for the patient and finally in a considerable percentage of incisional hernias.

Table IX shows the incidence of wound infections in the various

types of cases. The incidence of infections following operations for salpingitis in the acute stage is about three times that in operations for chronic inactive salpingitis.

TABLE IX. INCIDENCE OF WOUND INFECTIONS

TYPE OF CASE	NO. OF CASES	NUMBER OF INFECTED WOUNDS	PER CENT
Microscopically and clinically active	99	19	19.1
Microscopically active but clinically inactive	89	14	15.7
Chronic inactive	878	58	6.6

PROBLEMS IN WOUND HEALING

As I stated before delayed and defective wound healing is the most important factor which contributes to a prolonged postoperative stay in the hospital. Delayed wound healing results from both infection and drainage. Table X shows the combined incidence of drained or

TABLE X. PROBLEM IN WOUND HEALING SHOWING PERCENTAGE OF COMBINED DRAINED OR INFECTED ABDOMINAL WOUNDS IN THE VARIOUS TYPES OF CASES

TYPE OF CASE	NO. OF CASES	TOTAL NUMBER OF DRAINED OR INFECTED WOUNDS	PER CENT
Clinically and microscopically active	99	43	43.4
Clinically inactive but microscopically active	89	19	21.3
Chronic inactive	878	116	13.2

infected wounds. In other words it represents the percentage of cases in which we had a problem in wound healing. It indicates that the percentage of problems in wound healing is increased more than three-fold if patients are operated upon in the presence of active infection.

TABLE XI. COMPARATIVE SUMMARY OF THE AVERAGE NUMBER OF POSTOPERATIVE HOSPITAL DAYS IN CASES DRAINED BY THE VARIOUS ROUTES

ROUTE OF DRAINAGE	MICROSCOPICALLY AND CLINICALLY ACTIVE		MICROSCOPICALLY ACTIVE BUT CLINICALLY INACTIVE		CHRONIC INACTIVE	
	AVERAGE NO. OF DAYS OF DRAINAGE	AVERAGE NO. OF HOSPITAL DAYS	AVERAGE NO. OF DAYS OF DRAINAGE	AVERAGE NO. OF HOSPITAL DAYS	AVERAGE NO. OF DAYS OF DRAINAGE	AVERAGE NO. OF HOSPITAL DAYS
Normal convalescence. No drainage		17.8		17.2		17.5
Vaginal	8.6	23.1	8.0	18.7	8.4	20.1
Abdominal	9.8	29.7	7.8	19.8	10.5	25.5
Abdominal and vaginal	9.0	29.7	7.6	22.0	9.5	28.0

Table XI shows a comparative study of the average number of postoperative hospital days of cases drained by the various methods and

indicates that drainage by the vaginal route is preferable. The shorter period of hospitalization in this class of cases is due, I believe, to the fact that delayed wound union is avoided. To shorten the postoperative stay in the hospital is important economically both to the patient and to the hospital.

MORTALITY

Table XII shows the incidence of mortality in the various types of cases.

TABLE XII. MORTALITY

TYPE OF CASE	NO. OF CASES	GROSS MORTALITY		MORTALITY FROM SEPSIS	
		NO. OF DEATHS	PER CENT	NO. OF DEATHS	PER CENT
Microscopically and clinically active	99	13	13.1	11	11.1
Microscopically active but clinically inactive	89	3	3.3	2	2.2
Chronic inactive	878	25	2.8	13	1.4

Those who have studied the results of operations for salpingitis in other clinics have reported similar percentages of mortality.

Table XIII shows detailed lists of the causes of death in active and inactive cases. A high percentage of the deaths is caused by shock and sepsis.

TABLE XIII. CAUSES OF DEATH

<i>Active Cases:</i>	
Peritonitis and septicemia	12
Shock and sepsis	1
Shock and cardiac disease	1
Shock	1
Respiratory failure (death on table)	1
	Total
	16
<i>Inactive Cases:</i>	
Peritonitis	13
Cardiac disease	4
Pneumonia	3
Pulmonary embolism	3
Diabetes	1
Intestinal obstruction, ileotomy on 11th day, shock	1
	Total
	25

Table XIV shows an analysis of the end-results in the various types of cases. It proves quite definitely that the end-results were better when patients were operated upon after the infection had become inactive. The increased number of deaths in the two active groups accounts for the smaller percentage of these patients seen for follow-up examinations.

Tables XV and XVI give detailed lists of the conditions for which active and inactive cases were considered unsatisfactory when exam-

ined in the follow-up clinics. These tables also give lists of secondary operations which were done and the number of pregnancies which had been reported in each of the groups of cases.

TABLE XIV. FOLLOW-UP ANALYSIS

DATA	CHRONIC INACTIVE		MICROSCOPICALLY ACTIVE BUT CLINICALLY INACTIVE		MICROSCOPICALLY AND CLINICALLY ACTIVE	
	NO. OF CASES	PER CENT	NO. OF CASES	PER CENT	CASES NO. OF	PER CENT
No. of cases operated upon	878	--	89	--	99	--
No. of cases in follow-up	802	91.3	81	91.0	79	79.7
No. of cases never seen in follow-up including deaths	76	8.6	10	11.2	28	28.2
End-result was known including deaths	826	94.0	84	94.3	92	92.9
Satisfactory cases	649	80.9	57	70.3	49	62.0
Unsatisfactory cases	153	19.0	24	29.6	30	37.9
End-result unsatisfactory including deaths	177	21.4	27	32.1	43	46.6

TABLE XV. FOLLOW-UP ANALYSIS. UNSATISFACTORY ACTIVE CASES

	NO. OF CASES
Cystic ovaries	15
Inflamed adnexa	10
Urological	8
Incisional hernias	6
Pelvic pain	5
Retroversion	5
Wound sinuses	2
Menstrual irregularities	2
Leucorrhoea	1
Total	54
<i>Secondary Operations:</i>	
Abdominal for adnexal conditions	3
Vaginal: Dilatation and curettage	2
Plastic on cervix	1
Incisional hernias, all were tuboovarian abscess or pyosalpinx cases	6
Pregnancies	2

Table XVII shows a summary of data, and I believe that it is the most convincing evidence that I can offer in recommending that laparotomy for the cure of salpingitis while the infection is still active should be absolutely avoided.

Unfortunately surgeons who have so enthusiastically recommended operation for salpingitis while the infection is still active have not always given us statistics showing their operative results.

In the hands of very expert men results are sometimes achieved and surgical procedures are advised which would be dangerous if generally adopted.

TABLE XVI. FOLLOW-UP ANALYSIS. UNSATISFACTORY INACTIVE CHRONIC CASES

	NO. OF CASES
Ovarian cysts or cystic ovaries	38
Pelvic pain	31
Retrodisplacements of the uterus	22
Menstrual disorders	14
Leucorrhœa	10
Adnexal inflammation	8
Dysmenorrhœa	7
Backache	7
Sterility	7
Incisional hernias	5
Persistent wound sinuses	3
Urinary conditions	1
Total	153
<i>Secondary Operations:</i>	
Dilatation and curettage	3
Dilatation and curettage and stem pessary	1
Curettage and radium	2
Curettage for incomplete abortion	1
Abdominal operations for adnexal disease	16
Total	23
<i>Pregnancies:</i>	
21 patients had a total of 23 pregnancies	

TABLE XVII. SUMMARY OF DATA. COMPARATIVE OPERATIVE RESULTS IN PERCENTAGE IN THE VARIOUS TYPES OF CASES

DATA	MICROSCOPICALLY AND CLINICALLY ACTIVE	MICROSCOPICALLY ACTIVE BUT CLINICALLY INACTIVE	CHRONIC INACTIVE
Mortality: a. Gross	13.1	3.3	2.8
b. Sepsis	11.1	2.2	1.4
Conservative operations	39.4	41.2	50.6
Drained wounds—Abdominal	30.3	11.1	5.9
Vaginal	29.2	18.1	4.8
Vaginal and abdominal	6.0	3.3	1.0
Wound infections	19.1	15.7	6.6
Problem in wound healing—			
Drained or infected wounds	43.4	21.3	13.2
1. Morbidity	33.3	14.6	11.5
2. Morbidity including infected wounds	52.5	30.3	18.1
Follow-up results:			
1. Unsatisfactory	34.1	30.3	19.0
2. Unsatisfactory, including deaths	40.2	34.1	21.4

Quoting from Dr. Jeff Miller, who recently wrote an article on this same subject we find this matter very well stated. He says:

In the hands of expert men good results sometimes follow even the violation of all the principles of sound surgery, but we would point out that unfortunately most operations are done not by expert gynecologists but by men who are frequently neither experienced nor expert, and it is well, therefore, to inquire how the practice works out when it is generally applied.

From the statistics which I have presented I must conclude that:

1. Laparotomies for the cure of salpingitis while the infection is still active should be absolutely avoided.

2. Dangerous smouldering infections may be present in the pelvis which, even after bimanual examination, may not be accompanied by leucocytosis or fever. Sedimentation time should be used routinely to aid in detecting the existence of active infection in such cases.

3. Abdominal operations for salpingitis while the infection is still active are accompanied by an unjustifiable mortality, excessive morbidity, especially from shock, sepsis and defective wound healing, a high percentage of radical surgery and disappointing end-results.

4. Patients who have pelvic infections should be allowed long periods of convalescence and palliative treatment. If after such treatment spontaneous cures do not occur and operations eventually become necessary, the results will show a minimum percentage of mortality and morbidity, and a maximum percentage of conservative surgery and satisfactory end-results.

5. If operation seems unavoidable after a prolonged period of convalescence and palliative treatment, a cure by laparotomy should not be attempted until the inflammatory exudate about the focus of infection has been absorbed and the leucocyte count, temperature, and sedimentation time are normal.

6. Drainage of the peritoneal cavity by the vaginal route is superior to other methods. By this method the period of postoperative morbidity from delayed wound union and the incidence of postoperative incisional hernias are materially decreased.

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AN ANALYSIS OF CESAREAN SECTIONS PERFORMED IN LOS ANGELES FROM 1923 TO 1928 INCLUSIVE*

BY WILLIAM BENBOW THOMPSON, M.D., LOS ANGELES, CALIF.

WITHIN the past few years, the literature dealing with abdominal delivery has increased to such an extent that it is difficult to find any complication of pregnancy for which this mode of treatment has not been advocated. Originally restricted to desperate attempts to forestall impending rupture of the uterus in absolute pelvic contractions, gradual improvement in technique and in knowledge has given rise correspondingly to a gradual increase in logical indications, and a rapid increase in border line possibilities for its performance. The publications by enthusiasts, and likewise the publications of large or small series by individuals and by carefully controlled groups, have inevitably led to an increase in the operative incidence throughout the country, and undoubtedly to an increase in the total tragic results obtained through this method as opposed to more conservative measures. Of greater value, I believe, than the glowing accounts from various capable operators are the reports collected from a community as a whole, in that these alone offer the opportunity of cross-section analyses of the obstetric results obtained by the medical profession in general, and consequently the poor as well as the good features are available for study. It is with this belief, therefore, that I bring a survey of 1322 abdominal deliveries performed in the twelve largest hospitals in Los Angeles from 1923 to 1928 inclusive. While these are grouped somewhat after the method employed by Holland,¹ and which was likewise followed by Gordon,² some differences will be apparent. These are due largely to the difficulties encountered in the records themselves, in which data would have been valuable, such as previous obstetric history, measurements, and postoperative notations, but oftentimes were omitted; again multiple indications were listed without detail as to which one was considered the most prominent. With the exception of 139 case records reviewed for me by Dr. A. H. Larson, all of these case histories have been studied personally and not by questionnaire.

There are in Los Angeles 21 registered general and 7 specialized hospitals and homes accepting obstetric patients, but proper case records are not available in most of the smaller institutions. Two hospitals not registered and not eligible for registry are included in this survey. In all, 13 of the large general hospitals cooperated by furnishing their records for study (Table I), with a range in incidence of from 1 in 11.7 to 1 in 106.4 deliveries, and an average of 1 in 21.6. Hospitals

*Read before the Section on Obstetrics, Gynecology and Abdominal Surgery at the Eightieth Annual Session of the American Medical Association, Portland, Oregon, July 12, 1929.

"A," "H," "I" and "K" have been constructed since January 1, 1923, and their records are, therefore, from the date of opening. Hospitals "C," "D," and "G" began indexing systems three, three, and two years ago respectively, and incidence prior to that time is not obtainable. However, Hospital "C" had in the preceding two years 103 sections which were studied as a part of this series. Hospital "A" could not locate 6 case records. Consequently the mortality as listed (in the last column) is based for "A" on 106 and not 111 cases, and for "C" on 186 and not 83 cases. With the exception of Hospital "A," every patient in each hospital during the years noted was examined. The figures for the L. A. General Hospital are given for their comparative value only, and the sections are not analyzed further. A large city maternity service more than doubles the total deliveries as shown for the General Hospital, and in addition many neglected and improperly treated patients are admitted. The incidence here probably is lower than is proper for the number and type of cases delivered in the Hospital, due to cases which were improperly treated before hospitalization and in which, therefore, abdominal delivery was contraindicated, but the additional field of the Maternity Service, where indications are recognized and patients sent in without mishandling, probably offsets the neglected class.

TABLE I. SCOPE OF SURVEY A

HOSPITAL	DELIVERIES	TOTAL CESAREANS	INCIDENCE 1 TO	MORTALITY PER CENT
				Series
A	1404	111	11.7	6.6
B	3000	212	14.1	2.8
C	1166	83	14.0	4.3
D	2335	138	17.0	3.6
E	2986	159	18.7	3.1
F	4890	229	21.4	5.5
G	505	23	21.9	4.3
H	1207	55	21.9	1.8
I	990	37	26.8	0.0
J	1103	37	29.8	0.0
K	3752	111	34.0	9.0
L	3193	30	106.4	3.3
Total	26531	1225	21.6	4.2
L. A. General	7342	204	36.0	7.8

NOTE—A-H-I-K, from opening.

C-D-G, from date of indexing.

A, 6 case records lost.

C, 102 cases in previous two years studied, incidence not obtainable.

The hospital statistics show a remarkable variation in incidence and in mortality. Note that in two hospitals with 3000 deliveries in six years, one has an incidence of 1 in 14.1 and the second has an incidence of 1 in 106.4. We might be led to believe either that in the one hospital indications were extended far too widely and that the attending physicians there were careful to permit no operative possibility to escape, or that in the other, cases which should have been delivered abdominally were mishandled through improper attention on the part of the attending staff. The possibility that a large percentage of the pathologic material gravitated to the staff members of the institution of high incidence should also be considered. In a presentation of this type, personal impressions should be excluded and con-

sequently the figures are presented as they were obtained, with an avoidance, so far as possible, of any bias on my part. An average mortality of 4.2 per cent for the series finds a range from 0 in two of the smaller institutions to 9 per cent in one of the largest obstetric departments listed. This would seem to indicate that the common practice of informing patients that this operation carries no more risk than that of an interval appendectomy, is in error.

TABLE II. SCOPE OF SURVEY B

YEAR	HOSPITALS		
1923	5		
1924	8		
1925	9		
1926	11		
1927	12		
1928	12		

	CLASSICAL SECTIONS	LOW CERVICAL SECTIONS	PER CENT LOW CERVICALS
1923-27	859	155	15.3
1928	201	107	34.7
Series	1060	262	19.9

Table II indicates for each year the number of hospitals with available records, together with the classification for 1928 as to classical and low cervical sections. The continued teachings of DeLee, Beck, and others seem to be bearing results, as in the past year the percentage of low cervical sections has increased remarkably over that of the preceding five years. That the operation is not foolproof, however, is noted later, as 4 cases of death from peritonitis are listed, and operative morbidity is considerable.

It was interesting, although terrifying, to discover that there were in Los Angeles 201 physicians who considered themselves competent to perform an abdominal delivery, whereas only 42 are among the 94 listed in the *American Medical Association Directory* as either limiting their practice, or giving particular attention, to obstetrics as a specialty. In the list of operators, 75 performed only 1 case each, and 59 more, from 2 to 5 cases. Eight are credited with 40 or more, 5 with 50 or more, and 2 with 75 or more operations.

CONTRACTED PELVIS (TABLE III)

There are 487 women listed as having contracted pelvis. Of these, 78 are in the "previous cesarean" classification, and repetition of the former procedure was logical. Twenty-three had previous vaginal deliveries, but by high forceps, or with dead babies or complete tears or both, as a result. Four had 2 stillbirths. One had had repair work, type not listed. Fifty-two multiparæ presumably had living children with vaginal delivery, since no notation as to previous difficulty was recorded. Three of these charted as "indication contracted pelvis" had each been

delivered spontaneously of 2 living children weighing $7\frac{3}{4}$ pounds or more. These 3 are among the 21 of group "C" who were sterilized at cesarean.

Twelve deaths occurred in this group. There were 5 deaths from sepsis, and a sixth in which post eclamptic toxemia was added to sepsis. One died in eclampsia, and another from eclamptic toxemia, the convulsions having ceased. A preeclamptic patient succumbed after a long labor, death being due in part to exhaustion. One woman developed intestinal obstruction and died shortly after the second laparotomy. Two died from shock.

TABLE III

487 Contracted Pelves	
A Previous cesarean operations	78
B Previous obstetric difficulties	
Dead babies	15
High forceps	3
3° lacerations repaired	5
"Previous operation"	1
C Multiparae without notation as to previous obstetric difficulties	52
D Sterilized, group C	21

PREVIOUS CESAREAN SECTION (TABLE IV)

There were 197 women who had cesarean section previously. Of these, 119 had normal pelves, and 1 had a vaginal delivery between her first and second cesarean section before being sterilized at the third section. Fifteen others had had 2 cesarean sections, of which 12 were sterilized with the third. Two women had had 3 cesarean sections, and 1 was left with tubes intact after the fourth laparotomy. The remaining 180 had one earlier section each.

The uterine scars were subjected to the strain of labor in 31 instances, the time varying from the beginning of labor to seventy-two hours. According to Holland,³ 8 ruptures would therefore be the expectancy. As a matter of fact, there were 4 ruptures encountered in the entire 197. One of these occurred spontaneously at seven and one-half months, and the remaining 3 after two and one-half, six, and eight hours of labor respectively. The latter 2 recovered after resuture of the early rupture and tubal resection in 1, and hysterectomy in the other.

TABLE IV. PREVIOUS CESAREAN IN LABOR

"Early"	6	7 hours	1
2 hours	3	8 hours	2
3 hours	3	10 hours	2
4 hours	2	11 hours	1
5 hours	3	12 hours	1
6 hours	2	18 hours	1
		72 hours	1
In labor—time not stated			3
Not in labor			166

It is within the realm of possibility that six hours might elapse between the time of the onset of labor and the performance of cesarean section, where this has been the intention, but the fact that 9 patients were in labor for seven hours or more seems an evidence of neglect either on the part of the attendant or on the part of the patient herself. There are no data as to how many patients in Los Angeles had vaginal delivery after cesarean section, only 1 such instance being recorded in this present group.

Among these 197, there were 8 fatalities. Two were due to hemorrhage and shock from ruptured scars, one occurring spontaneously at seven months, and 1 at term in labor two and one-half hours. The operator of the latter took time to remove an ovarian cyst and resect the tubes, and her death an hour later, untransfused, was possibly preventable. One secondary hemorrhage from the uterine artery after Porro section seems also a preventable fatality. Pulmonary embolism on the eleventh day was an accident not capable of being foreseen except that this patient was supposed to have been sterilized at her previous section. One patient had eclampsia, and convulsions were not controlled by delivery. One patient had pre-eclamptic toxemia together with premature separation of the placenta, and died of postpartum eclampsia. One patient developed intestinal obstruction after two days, and died shortly after the second laparotomy. The remaining patients died of operative shock.

ECLAMPSIA (TABLE V)

The present trend in the treatment of eclampsia is toward conservative measures. Williams²⁴ masterly review of his results in 275 cases shows 25 per cent mortality for early delivery, chiefly by cesarean, and 10.5 per cent for treatment without hurried emptying of the uterus. Moreover, his operative results were obtained under carefully controlled surroundings, and the operations were by carefully trained obstetricians. At the Los Angeles General Hospital, with the adoption of standardized intravenous magnesium sulphate therapy has come a vast improvement in mortality. The previous figure of 36 per cent⁵ has dropped to 7 per cent⁵ since surgery has been abandoned except for pelvic indications. C. Jeff Miller⁷ remarks, "To return to the indications for cesarean section, eclampsia does not belong in this list." However, there is an undercurrent to this logical trend

TABLE V. ECLAMPSIA 46

TABLE V. ECLAMPSIA 46			
<i>Pelvis</i>			
Normal	22	Contracted	5 (1 at term)
<i>Other Indications</i>			
Previous cesarean section	2	Contracted pelvis	1
		Morbidity	Severe Morbidity
		Per Cent	Per Cent
Not in labor	41	34.1	12.2
In labor	4	20.0	20.0
	Convulsions continued P.P.	12	26.1 per cent
<i>Fetal mortality</i>	14.7 per cent	<i>Fetus premature</i>	9
<i>Maternal mortality</i>	28.3 per cent		
Eclampsia	7		
(Convulsions continued)			
Posteclamptic toxemia	4		
Nephritis plus sepsis	1		

which emanates from the Chicago Lying-In Hospital, and which would carry us back on the tide of infiltration anesthesia to immediate delivery. Although DeLee and his associates urge that others, not highly trained specialists in highly specialized hospitals, should not attempt to duplicate their results, there are far too many men who reason that if such outstanding leaders advocate the procedure, it should be carried out forthwith. Certainly if surgery is to be performed, local infiltration is the anesthetic of choice. Stander⁸ has shown conclusively that the same abnormal changes present in the blood stream of eclamptics are produced by any of the inhalation anesthetic agents. In spite of this conclusion so generally acknowledged, ether was used in nearly all the 46 cases in this present series where cesarean section was performed for or upon an eclamptic patient. Only 3 of this group

had other indications for surgery, 2 having had previous cesarean sections (both patients had normal pelves) and one had a contracted pelvis and was in labor at term. Four other contracted pelves are in the group, but 3 were with premature babies, and 1 a para iv without either a history of previous difficulty or previous section, is highly questionable as to fact. The results obtained by surgical intervention were far from happy. Twelve patients continued their convulsions, and 7 of these died. Four patients whose convulsions were controlled died shortly, of their overwhelming toxemia. One patient was probably a nephritic, her pressure remaining over 200 mm. with scanty urinary output, and a second one of nephritic type succumbed to sepsis. Eight fetal deaths among the 47 babies born were premature in 3 instances. One baby at term was a macerated stillborn infant, a twin, the other baby survived.

While the percentage of deaths, 28.3, is better than Miller's⁹ 41.5 in New Orleans (41 cases) or Welz's¹⁰ 42.7 per cent in Detroit (26 cases), it is practically seven times the mortality for the series as a whole, and far above the figure for this disorder in Los Angeles and vicinity when treated medically.

THE TOXIC GROUP (TABLE VI)

In the so-called "toxic group," a much larger number of cases may be considered. One hundred eighty-seven preeclamptics, 25 instances of premature separation, 3 with both, and 2 cases of toxic vomiting for which section was the final mode of treatment, are recorded for 211 patients. Due to the paucity of information encountered all too frequently, it is impossible to differentiate this group into further subclassifications. Undoubtedly there are here many mild toxemias in which a few symptoms were the basis for operation, and for which, in more conservative hands, surgical intervention would not have been utilized. This accounts to some degree for the much lower mortality than was found in the preceding group of eclamptics, where the classification, based upon convulsions, was much more simple. True, all convulsions associated with pregnancy are not due to eclampsia, but clinically speaking, after epilepsy has been excluded, convulsions and eclampsia are synonymous. While, as Williams⁴ points out, the more severe cases of the nonconvulsive type should have their pregnancies terminated and by cesarean section if necessary, it should not be considered that the risk, compared with eclamptics, is so much decreased as these figures indicate, due to the unavoidable grouping here of mild and severe toxemias. The fact that, of 50 multiparae, only 8 had had previous sections, only 4 had had dead babies in previous vaginal deliveries, and only 6 had contracted pelves, would seem to indicate that the 18 sterilizations of multiparae of this group constituted at least an added reason for the selection of the abdominal route in effecting the desired termination of pregnancy. For the 83 primiparae with normal pelves, and 39 primiparae for whom pelvic measurements were not recorded, there is considerably less question as to the advisability of the form of treatment, since these toxic patients, as a class and as primiparae, tolerate induction of labor by bag or bougie much less favorably than do nontoxic multiparae.

That termination of pregnancy does not invariably check the continuation of the toxemia is indicated by five instances of postpartum convulsions, ranging from 1 to 6 in number. Here again the unwise choice of anesthesia may have been the factor which, added to the toxemia, caused these unhappy events. As previously remarked, ether was the anesthetic agent most frequently employed, and but few cases were delivered either by spinal or local infiltration novacaine.

Eleven or 5.4 per cent of these 211 patients died. Two of the 5 who developed postpartum eclampsia, and 2 apparently of the nephritic type who died in coma, succumbed to their toxemias. In 2 others, one with sepsis and the other with

exhaustion added to the preexisting condition, the toxemia was at least partially a factor. Of the remaining 5, 2 were from peritonitis, 1 from hemorrhage from a premature separation, 1 from pulmonary embolism and 1 from shock. Fetal deaths totaled 30, of which 10 were premature infants, and 2 of the latter were born from multiparae.

For the entire series of toxemias, 266 (1 eclamptic had premature separation also), 38 babies were lost, 14.3 per cent, an increase of 75 per cent over that for the series as a whole.

TABLE VI. TOXEMIA GROUP

Preeclamptic toxemia		187		
Premature separation of placenta		25	(3 with preeclampsia)	
Toxic vomiting		2		
Total patients		211		
Primiparae	143	Contracted pelvis		21
Multiparae	51	Contracted pelvis		6
Not stated	17	Contracted pelvis		1
Other Indications				
Previous C. S.	8	Cardiacs		3
Previous stillbirths	4	Malposition fetus		4
Placenta previa	3	No progress		8
Eclampsia	1	Fibroids		1
Elderly primiparae	6	Disproportion		
		(Naegele pelvis)		1
		Cervix operated		1
Morbidity				
Temperature 100.4 or over		73	34.6 per cent	
1 day only		24	11.8 per cent	
Severe infection		24	11.8 per cent	
Mortality				
Premature separation		2		
Preeclamptic toxemia		10	(1 with separation)	
		11	Deaths	6.1 per cent
Fetal mortality				14.3 per cent

PLACENTA PREVIA (TABLE VII)

Of the 68 cases of placenta previa, only 8 were located as to type; 1 of these was central, the other marginal. Associated indications show that the hemorrhage was to a large extent the basic reason for interference, as only 10 women had contracted pelvis; 25 of these patients were multiparae with normal pelvis, of whom

TABLE VII. PLACENTA PREVIA

	<i>Pelvis</i>			
	NORMAL	CONTRACTED	NOT STATED	
26 Primiparae	19	1	6	
34 Multiparae	25	4	5	
8 Parity?			8	
<i>Additional Indications</i>				
Preeclampsia	3	Eclampsia	1	
Fetal malposition	2	History stillbirth	3	
Cardiac disease	1			
MORBIDITY	1 DAY	SERIOUS	MORTALITY	PER CENT
23	6	12	4	6.0

6 were sterilized. Only 1 of these multiparae, however, had a baby that died of prematurity, and hence the increased possibility of securing a living baby justifies the incidence to some extent. However, the maternal mortality of 6.0 per cent is a high price to pay for the additional babies saved. From the Hopkins Clinic service up to 1920 I¹¹ reported a series of 36 cases treated by intraovular bag without maternal death. All of the 4 deaths of this group were due to infection.

STERILIZATION (TABLE VIII)

Sterilization as an accompanying procedure was noted in 305 instances either by Porro section (38 cases) or by removal or section of the tubes. Of these, the previous cesarean section patients were sterilized in approximately 50 per cent of the cases. Of the 43.9 per cent of multiparae undergoing their first cesarean sections, in 27 instances sterilization was given as the indication or one of the indications. Because of the large number of multiparae in this classification who were sterilized, this procedure itself was probably a more frequent basis for abdominal delivery. In many more than the 27 listed it is highly questionable as to whether an operative procedure carrying a 4 per cent or greater mortality risk should be advocated for a patient capable of being delivered through the vagina, especially since Peterson¹² has just reported a series of 1208 elective gynecologic cases without any mortality. In other words a patient by being sterilized at section has a 4 per cent risk, whereas, were she delivered and the sterilization performed at an elected time, this mortality could be materially reduced. Sixty-four primiparae were sterilized on account of fibroids, 14; heart and lung diseases, 14; other systemic diseases, 2; and Porro section for intrapartum infection, 1. Of the remainder a number would seem to have been sterilized on insufficient grounds, and for 14 absolutely no indications could be located. Of these 64 primiparae sterilized, 3 babies succumbed, 1 from prematurity. Likewise, 3 para ii were sterilized who had lost their first babies, and the baby of 1 of these 3 died of prematurity, the section being done as an elective procedure by a general surgeon who failed to recognize that the uterus was not at term.

TABLE VIII. STERILIZATION

GROUP	TOTAL CASES	STERILIZED	PER CENT
Previous cesarean sections	197	100	50.7
First cesarean section multiparae	264	116	43.9
Parity not stated	162	25	15.0
Primiparae	699	64	9.0

STERILIZATION PRIMIPARA

BASIS	NUMBER
Fibroids—Porro	9
“Nervousness”	2
Fibroids, not Porro	5
Intrapartum infection—Porro	1
Cardiac disease	8
Diabetes (baby died)	1
Tuberculosis	6
Pyelitis (baby died)	1
Nephritis and preeclampsia	9
Hyperthyroid	1
Eclampsia (1 died)	2
Ovarian cyst	1
Elderly primiparae	3
Dysmenorrhea	1
No cause recorded	14

OTHER INDICATIONS (TABLE IX)

Other indications included practically every possible complication to which pregnant women are subject. These will not be mentioned in detail other than shown since each shows but a very few examples. The outstanding features of this group are the disorders and diseases used as indication for surgical intervention, which would seem to have absolutely no logical place in a review of this type. Particularly, I wish to call your attention to the fact that 2 cesarean sections were done because of fetal death; that 1 hydrocephalic was diagnosed and delivered abdominally; that request was deemed sufficient in 4 instances; and that, for a primipara of 33 who had an intractable dysmenorrhea, instead of allowing labor to progress normally with the expectation that the dilatation of the cervical canal would relieve the pre-existent disability, the surgeon elected to perform a cesarean section and remove the uterus in order that his patient might no longer have this distress.

TABLE IX. INDICATIONS

Pelvic disproportion	488	Previous cesarean sections	197
Eclampsia	46	Preeclampsia	187
Premature separation	25	Placenta previa	68
Previous operations	30	Fetal malposition	61
No progress	112	Old primiparae	55
Cardiac disease	38	Fibroids	28
History of difficulties	29	Sterilization	27
No causes found	42	Insanity	1
Prolapsed cord	4	Epilepsy	1
Prolapsed cervix	1	Anemia	2
Fetal distress	2	Pernicious anemia	1
Contraction ring	3	Request	4
Ruptured uterus	4	Thyroid	1
Intrapartum infection	1	Diabetes	1
Intestinal obstruction	1	Pyelitis	2
Cervix irradiated	1	Gain in weight	1
Appendicitis	1	Nervousness	2
Recent laparotomy	1	Doubled uterus	1
Strangulated hemorrhoids	1	Dysmenorrhea	1
Hydrocephalic baby	1		

(As charted. Multiple indications credited in proper groups.)

TABLE X. MORBIDITY

1060 CLASSICAL SECTIONS		FEVERS	ONE DAY ONLY	TWO DAYS OR MORE PER CENT	SEVERE PERCENTAGE
Not in labor	698	244	71	24.8	13.8
6 hr. or less	87	25	2	26.4	13.8
6 to 12 hr.	59	26	5	35.6	16.9
12 to 24 hr.	79	47	3	45.8	27.8
24 to 36 hr.	27	18	2	59.0	33.3
36 to 48 hr.	22	15	3	54.7	27.3
48 plus hr.	27	10	0	37.0	37.0
In labor ? hr.	61	29	7	36.0	22.4

262 LOW CERVICAL		FEVERS	ONE DAY ONLY	TWO DAYS OR MORE PER CENT	SEVERE PERCENTAGE
Not in labor	88	37	12	28.4	12.5
6 hr. or less	15	10	2	53.3	20.0
6 to 12 hr.	32	16	7	28.0	22.5
12 to 24 hr.	50	25	8	34.0	16.0
24 to 36 hr.	32	16	3	40.6	34.3
36 to 48 hr.	13	7	1	46.3	34.3
48 plus hr.	13	9	1	61.5	46.3
In labor ? hr.	19	10	2	42.1	15.8

MORBIDITY (TABLE X)

A temperature of 100.4° or over, occurring after the first forty-eight hours, was taken as the standard for determining morbidity. The operative reaction incident to any clean laparotomy was thereby excluded. Where postoperative notations indicated that intercurrent disorders were responsible for temperatures, these were deducted in compiling the figures shown. Severe reactions are those in which there was fever for at least four consecutive days. As the "hours in labor" increase, there is an almost corresponding rise in the morbidity rate. This is to be expected, since Harris and Brown¹³ in a series of 50 consecutive sections, noted bacteria in the endometrium of each woman in labor six hours or more.

MORBIDITY AND MORTALITY (TABLE XI)

Since Holland's¹ series has come to be the standard by which all other series are compared, it is interesting to note that, of the 1060 classical sections, 698 were operated upon at the time of election, with a mortality of 4.1 per cent, and 362 after the onset of labor, with exactly the same mortality. While the curve for each succeeding group arranged according to the hours of labor shows a general upward trend in both morbidity and mortality, this series is sufficiently large to expect Holland's percentages to be more closely approximated.

TABLE XI. MORTALITY

HOURS IN LABOR	CASES	CLASSICAL	CASES	LOW CERVICAL
None	698	4.0	88	7.9
6 hours or less	87	3.4	15	0.0
6 to 12 hr.	59	1.6	32	3.1
12 to 24 hr.	79	5.0	50	0.0
24 to 36 hr.	27	7.4	32	3.1
36 to 48 hr.	22	9.0	13	0.0
48 plus hr.	27	3.7	13	15.4
In labor 9 hr.	61	3.8	19	10.5
Over 24 hr.	76	6.6	58	5.2
Total	1060	4.1	262	4.9

FETAL DEATHS (TABLE XII)

There were 107 fetal deaths out of the 1343 babies (twins 21) born in this series; 7.9 per cent would be serious enough for as many vaginal deliveries, but when only abdominal deliveries are done, with so little fetal trauma, the percentage of fetal deaths should be infinitely smaller. Thirty-seven of these deaths were premature infants, 6 were monsters, and 5 were stillborn in addition to 5 stillborn with previous section and eclampsia as indications. Cesarean section under ordinary circumstances should result in living babies, and the high figure noted needs more explanation than I can find.

MORTALITY (TABLE XIII)

Classified according to the cause of death, "shock," including the 2 ruptured scars and the 1 case of hemorrhage from the uterine artery, accounts for 10 cases. Various other accidents of laparotomy (pulmonary embolism 2, mesenteric thrombosis 1, intestinal obstruction 1) add 4 more. Hemorrhage from premature separation and from an independent gastric ulcer, as well as the case mentioned under shock, cause 2 additional deaths. The toxemias (eclampsia 9, post eclamptic toxemia 3, nephritic toxemia 3, toxemia and exhaustion 1) resulted in 16 deaths, plus 2 mentioned later. Two patients succumbed to their preexisting cardiac disorders.

TABLE XIII. MORTALITY

CAUSE OF DEATH	CLASSICAL	LOW CERVICAL	TOTAL
Peritonitis	15	4	19
Nephritis and sepsis	1		1
Toxemia and sepsis	1		1
Toxemia and exhaustion	1		1
Nephritic toxemia	3		3
Eclamptic toxemia	3		3
Eclampsia	6	3	9
Hemorrhage, premature separation	1		1
Gastric ulcer		1	1
Intestinal obstruction	1	1	2
Cardiac disease	2		2
Pulmonary embolism	1	1	2
Mesenteric thrombosis	1		1
Shock	7	3	10
?	1		1
	44	13	57
INDICATIONS AS LISTED			
Pelvic disproportion	11	1	12
Previous section	7	1	8
Eclampsia	9	3	12
Preeclampsia	9	2	11
Premature separation	2		2
Placenta previa	3	1	4
Fibroids	2		2
Cardiac disease	3	2	5
Intestinal obstruction	1		1
Sterilization	1		1
Malposition	1		1
Elderly primipara	1		1
Previous operation	1		1
No cause found	3	2	5
	54	12	66

COMMENT

In view of the fact that 6 monstrosities were delivered in this series, it would seem worth while to subject patients, where this mode of treatment seems indicated, to an x-ray diagnosis. The two acrania and two hydrocephalics would easily have been picked up and these four in particular need not have been delivered through the abdomen. One hydrocephalic was diagnosed prior to the operation, but the condition was made the basis for surgical delivery, since the surgeon felt that such a large head could not be delivered through the vagina. Likewise, the confession that 27 appendices were removed at cesarean section, while followed by only one death directly as a result of this procedure, disturbed the convalescence of over 50 per cent of this group and certainly cannot be commended as an obstetric procedure. One individual in addition had her gall bladder removed simultaneously. Only one of these appendix operations was an emergency matter. Two other emergency operations were combined with sections, one being an ovarian cyst with twisted pedicle and the other an intestinal obstruction from which the patient died.

Secondary in importance only to the results obtained is the value of maintaining records capable of giving complete information upon re-study. Corrigan is said to have described the relation between water-hammer pulse and aortic regurgitation after a study of six cases, but few indeed can draw logical conclusions from a small series. The great majority of us must depend upon the combined experiences of large groups in the same field. It is our duty, therefore, to leave available for study case records sufficiently complete that others may be able to glean the facts which were fresh before us while the patients were under our direction. To find, as I did, a notation that cesarean section was done because of double uterus and vagina with no further mention of this interesting anomaly; to find only 8 of 68 placentas previa located as to type; to find frequently "contracted pelvis" without any measurements detailed; all this is discouraging. We have learned from others, and we can repay our debt only by learning information from which others may learn.

No doubt, in many of these borderline indications the patient received the best possible attention of the operator. The qualified general surgeon, who is at best but a casual operator in the obstetric field, is probably better fitted to perform a cesarean section before the onset of labor than he is to extricate himself from the possible difficulties that may ensue. So long as there are more physicians practicing obstetrics who are capable of dragging a baby through a sufficiently large abdominal incision than are capable of doing satisfactorily difficult internal version or mid-forceps delivery; so long as there are more unwilling to grant nature an opportunity than there are those who can estimate correctly what a test of labor is accomplishing; for so long such reviews as this will contain beautiful examples of bad obstetrics. And the millennium is a long way off.

SUMMARY

A series of 1322 cesarean sections, 1060 classical and 262 low cervical, performed in 12 Los Angeles hospitals in the years 1923 to 1928 inclusive, carried a mortality of 4.2 per cent. While this is an improvement over similar community reports from Detroit, New Orleans, and Brooklyn, there is much to be criticized in the performance of cesarean sections without adequate indications, in the large number of poorly written records, and in the failure to exercise proper obstetric judgment as to type and time of operation, anesthetic, and general care of patients who properly should be operated upon.

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1930 WILSHIRE BOULEVARD.

REPRODUCTIVE PHENOMENA IN THE MONKEY, MACACUS RHESUS*

BY CARL G. HARTMAN, PH.D., BALTIMORE, MD.

(From the Department of Embryology, Carnegie Institute of Washington)

THE invitation to address this society upon this occasion, inasmuch as I am not a medical man, I do not regard as a compliment to me personally, but rather as a recognition on your part of the contribution which animal experimentation may make to medical science. On my part I recognize the fact that until recently most of our anatomists and physiologists were medical men; one and the same person, in the early days of modern biology, visited the sick and experimented in the laboratory, a difficult combination, as some of you well know. It was John Hunter, I believe, who regretted having to leave his laboratory to go out and "earn that damned guinea."

In general it must be conceded that fundamental physiologic principles, whose establishment guides and advances medical practice, must be worked out first on animals. Conservatism must rule the medical practitioner; the interests of the patient are paramount. I desire, however, to mention an instance in which the transfer of information derived from the study of an animal to the conditions found in the human being was made with more harm than good. Recall that the problem of menstruation in women has been puzzling mankind for a thousand years. For centuries women were supposed to be the only living beings that underwent this periodic "cleansing process" or suffered the "curse." It was later found that female dogs also bled from the vagina, and this discovery led to an intensive study of the phenomenon, especially toward the middle of the last century, stimulated to no small degree by von Baer's discovery in 1827 of the true mammalian egg. Bischoff in Germany, Pouchet in France, Berry and Jones in England, in the thirties and the forties, noted that bitches bled only at the time of heat, and autopsies revealed the fact that at this time the ovaries contained ripe or freshly discharged follicles. In the latter case ova were found in the fallopian tubes. Autopsies by Coste, Bischoff, Ritchie and others on human cadavers also often revealed

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young corpora lutea and in a few cases ripe follicles in the subject's ovaries. Criteria for age of the corpora lutea not having been worked out (Leopold and R. Meyer not publishing their observations until the last years of the century), the human findings seemed to agree with those in the dog. Indeed, even as late as 1910 the preponderance of the literature seemed to favor the incorrect view, for in that year Havelock Ellis wrote that as premise to the biology of women we must recognize the fact that ovulation and menstruation are synchronous. It is to the efforts of the clinician that emancipation from this notion is due, and that the true relation of ovulation and menstruation has become established. One of the first explosions came from a country doctor, Sigmund, who, in 1871, published a one page paper, in the *Berliner Klinische Wochenschrift*. The conclusions reached by Sigmund were finally clinched by the work of R. Meyer, R. Schröder, Emil Novak, and many others since.

THE FUNCTION OF THE CORPUS LUTEUM

This modern view of menstruation thus worked out with much labor may be stated, so far as sequence of events goes, as follows: Twelve to eighteen days after the beginning of the menstrual flow, ovulation takes place and a corpus luteum is formed in the ovary. Under the influence of the corpus luteum the endometrium hypertrophies and enters the secretory phase. The egg dies, the corpus luteum begins to involute, the endometrium is to a large extent cast off and menstruation results. I desire to call attention to a few points in the analysis of this statement.

Now to my notion this statement should be interpreted merely as one of sequence of events in point of time as they usually occur in the human female. However, R. Meyer and his many followers have applied the *post hoc, ergo propter hoc* logic, and cause and effect are taken for granted. Take, for example, the absurd lengths to which R. Meyer's theory of the "Primat der Eizelle" leads us, the theory of the dominating influence of the egg. According to this, it is the death of the egg that initiates the degenerative changes of the corpus luteum, that minute speck of protoplasm (which is largely deutoplasm at that) that is supposed to be potent enough even from its site within the lumen of the uterus to influence the corpus luteum. It is to be granted that minute doses of organic compounds, as for example adrenalin, venoms, bacterial toxins, do have physiologic effects. Yet the "primacy-of-the-egg" theory surpasses the boldest dreams of high-potency homeopaths; for even considering the dying ovum 100 per cent "hormone," the volume relation to the active tissue mass of the body approaches 1:10¹⁰. But why theorize when there is not the slightest experimental evidence in favor of the theory, all the evidence is against it. I found, for example, removal of the fallopian

tubes with their ova in the opossum does not interfere with the sexual cycle, and similar results have been obtained by others in the rabbit in which pseudopregnancy is uninfluenced by such a procedure. Indeed, in a monkey (No. 63) I washed out an egg from the uterus by a



Fig. 1.—(1) Characteristic posture of *Macacus rhesus* during labor (female No. 43). (2) Female No. 2 delivers the afterbirth as she delivered the baby sixteen minutes before. (3) She eats the afterbirth ravenously. (4) The baby finds the nipple after much searching.

modification of the Allen-Pratt method, that is, per vaginam. This was on the sixteenth day of the cycle; the animal menstruated in due season just as though nothing had been done about the egg.

We know more about the functional relation of the corpus luteum, however. For the rabbit, Corner recently corroborated the classical experiments of Bouin and Angel and extended this work to include active extracts of the corpus luteum. Corner further showed that in the monkey the pregravid hypertrophy and secretory phase of the endometrium occurs only if the corpus luteum is present. We may be assured, therefore, beyond a reasonable doubt, that there is a causal relation between the pregravid (pseudopregnant) uterus and an active corpus luteum. Corner has further established the indispensability of the corpus luteum for implantation in the rabbit.

What, then, has the corpus luteum to do with menstruation? According to the prevailing textbook notion, the withdrawal of the pro-feeding action of a secreting corpus luteum is the cause of menstruation. Now it is true that in women there is usually found a degenerating corpus luteum at the time of menstruation. I. Frankel's observations, and hundreds since his introduction of the method of inspecting the ovaries of women at abdominal operation, have established the usual or normal picture. But that merely shows that the human female has learned to ovulate regularly the year around, and nothing more. The study is a statistical, not a physiologic one. There is no experiment to demonstrate the theory that menstruation is a passive phenomenon due to the absence or withdrawal of an inhibition. The reasons that can be stated at the present time are the following:

1. The observation that oophorectomy after the middle of the cycle results in menstruation can be shown not to constitute an argument in favor of the theory, for R. Schröder and others demand that menstruation be defined as a bleeding from a *pregnoid endometrium*. How can the uterus attain this condition if the ovaries are removed on the fifteenth, the eighteenth, or even the twenty-second day? Yet after the operation, bleeding nevertheless results. Such bleeding, I hear it argued, is pathologic. But I have noticed that the term pathologic is a handy *potpourri* for all cases that fail to fit in with the theory. Since, however, I have called for positive experiments, I will in my turn cite an experiment in the monkey, repeated twice, which completely refutes the argument except the one that has recourse to the vague shibboleth "pathologic."

In the monkey there occasionally occurs a lengthened cycle in which the animal shows excessive desquamation from the vaginal wall, leucocytosis from the cervix, brilliant sex skin, and sex swellings on sex skin, flanks, legs and base of tail; such an animal is drawing sex hormone from a large, thick-walled atretic follicle. The condition corresponds roughly to nymphomania with cystic ovaries in the cow, though in the monkey the ovaries are not cystic. Remove the atretic follicle and the color and swelling will recede in two days, in five or six the female will menstruate. The endometrium is strictly in the resting or

interval condition. Menstruation has resulted after removal of an atretic follicle.

Attention might here be called to another inconsistency in the gynecologic literature. It is contended that ovulation may occur at any time of the menstrual cycle, let us for the present accept unchallenged the records on which the contention is based. Nevertheless, whether ovulation be early or late, women menstruate regularly, some from a highly developed endometrium where ovulation occurred early in the cycle, some from an almost interval endometrium where ovulation occurred at the end of the cycle. But I shall not insist on this point in connection with my argument, for I do not accept the records that form the premise as trustworthy, for they depend upon the chastity of the informing women and that mostly in war time!

2. More crucial evidence is, however, furnished by the monkey, which often menstruates with regularity even though the ovaries are "empty," showing no corpora lutea whatever and indeed no visible graafian follicles. Is this regular uterine bleeding from an interval endometrium "pathologic"? Take these two cases: Monkey No. 39 was mated in August, September, and October. She was laparotomized in August and in October when inspection of the ovaries showed that the animal did not ovulate either in August or September, but only in October, when she became pregnant. Monkey No. 63 was opened four times and found to have ovulated each month from October through March, but not in June or July, and possibly not in May.

Further studies in our colony have shown that the summer months constitute a nonbreeding, a nonovulating, season, and have thus substantiated the contention, made by Miss Van Herwerden (1906) that in monkeys there is a breeding season in which menstruation with corpus luteum formation predominates, and a nonbreeding season in which ovulation does not occur but menstruation nevertheless continues. Since Van Herwerden worked on material gathered in the wild (as did Heape in 1887), there is no reason to suppose that the phenomenon is due to the deleterious influence of captivity and the heat of Baltimore summers. We must look, therefore, for the cause of menstruation somewhere *outside* the graafian follicle, perhaps outside the ovary, although we must concede that the gonad is essential to the continuance of menstruation; it may, however, be merely an intermediary, a link in the endocrine chain.

THE PLACENTAL SIGN

To my notion it will be profitable to correlate menstruation with implantation rather than consider it as a phenomenon *sui generis* that has arisen out of nothing in phytogenetic development. It is only since Cuvier's time that menstruation in the monkey has become generally recognized; before that time it was in some way connected with

the Garden of Eden. Man is no longer to be considered in a class to himself as far as reproductive processes are concerned, the study of the monkey and even "lower" mammals will serve to dispel the still too prevalent notion that to man has been assigned a special set of physical and chemical laws. It would seem to be profitable to make a comparative study in the greatest detail by the best cytologic technique on unhandled material (surgical specimens alone will not suffice to solve the problems) of the degenerative changes in the blood vessels and other tissues during implantation and during menstruation. For be it noted that the only "menstruating" animals are the higher primates and it is precisely in these that a peculiar type of placentalion, involving extensive hemorrhages, occurs. This correlation my chief, Dr. Streeter, agrees is not without significance and should be followed up by more detailed study than has been made before.

Details concerning the source of blood which constitutes the early sign of pregnancy for the monkey have been published in the *Bulletin of the Johns Hopkins Hospital* (44: No. 3), to which reference is here made for the sake of brevity. The sign has been found to obtain in all of 18 pregnancies that have occurred in the Carnegie Monkey Colony; it may be considered to occur in 100 per cent of cases. It remains to be seen if it will be available as an early test in the human species. The sign should manifest itself in women as a slight bleeding, usually microscopic, and hence not apparent to the subject, from about the time of the first "skipped" menstruation, continuing for about three weeks. If the sign is apparent, it would be considered a menstrual flow and the prospective mother would miscalculate her delivery by a month, as often happens.

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Society Transactions

AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS*

FORTY-SECOND ANNUAL MEETING

MEMPHIS, TENNESSEE, SEPTEMBER 16, 17, 18, 1929

THE PRESIDENT, DR. GEORGE VAN AMBER BROWN, OF DETROIT, IN THE CHAIR.

DR. WILLARD R. COOKE, GALVESTON, TEXAS, read a paper entitled **Transition to Malignancy of Benign Lesions of the Uterine Mucosa.** (For original article see page 210, February issue.)

DR. S. E. TRACY, PHILADELPHIA, PA., read a paper entitled **Sarcoma of the Vagina.** (For original article see page 279, February issue.)

DR. M. A. TATE, CINCINNATI, OHIO, read a paper entitled **Metastasis of Ovarian Carcinoma.** (For original article see page 285, February issue.)

DISCUSSION

DR. CHANNING W. BARRETT, CHICAGO, ILL.—Whether carcinoma of the uterus shall be operated upon or treated with radium is a very important subject for discussion at the present time. Whether a patient has carcinoma or not has to be considered first. A good many people will die of carcinoma of the uterus this year, and it does not matter so much whether they are treated by radium or x-ray or operation. If they are operated upon, some of them will die sooner. There might be a few who will be benefited by operation and live longer, but most of them would die very soon.

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DR. W. S. BAINBRIDGE, NEW YORK CITY.—The pathetic situation of the patient with cancer of the uterus who is trying to decide between surgery and radium therapy, has been forcibly brought home to me during a recent visit to 16 European countries. Nowhere in Europe, any more than in America, does there seem to be any uniformity of opinion on the subject. The great cancer centers, Prague, Louvain, Paris, and London, differ in their methods of treatment and in their results. Some of the most eminent men in the medical profession, Professors Faure, Hartmann, and Berkeley, have widely differing opinions on the proper approach to uterine carcinoma.

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Today in the control of uterine carcinoma we must look to (1) Careful periodic pelvic examinations of all women over forty years of age by competent examiners. (2) Repair of lacerations which follow childbirth. (3) Prevention or prophylactic treatment of infections. (4) Elimination of erosions, irritated areas and ulcera-

*For lack of space it is necessary to condense these discussions, but the complete report of the meeting will be published in the current volume of the Association's Transactions.

tions of the cervix. (5) When the carcinomatous stage has been reached, radical operation, with perfected surgical technic, the cautery or other forms of heat and possibly radiation as a postoperative adjuvant, is the surest method known today for the elimination of uterine carcinoma.

DR. JAMES E. KING, BUREAU, N. Y.—In connection with Dr. Tracy's paper I would like to report a case of sarcoma botryoides as a matter of record. The patient was a young girl eight years of age who had been under observation for about eight months by a general practitioner. The complaint was vaginal discharge, occasionally with a little blood. He found polypoid tissue just inside the vulva and with a snare removed it, but failed to have it examined. After several months she became worse and I was asked to see her. Examination was naturally difficult but we found a vagina filled with this peculiar polypoid material.

On October 11, 1928, under gas anesthesia, the vulva was stretched to admit the finger and the vault of the vagina found filled with polyp masses which seemed to spring from a single pedicle from the anterior lip of the cervix just inside the os. The masses had an opaque gelatinous appearance and on most of the bodies a slender pedicle could be found. The vagina was dilated and a small cervix drawn down and the pedicle severed close to the cervix. Some parts of the mass seemed necrotic, probably the result of previous efforts to remove tissue for examination. On October 23, 1928, under gas the cervix was brought down and gently dilated and this produced very little bleeding. Forty milligrams of radium in a silver capsule were inserted and allowed to remain four hours.

December 19, 1928, the cervix was explored and found to be perfectly normal. Thirty milligrams of radium in a silver capsule were inserted and allowed to remain five hours.

Three weeks ago the child was examined as well as possible without an anesthetic and no evidence of return was found. There was difficulty in this case because not having found any literature in regard to the use of radium in a young child I was somewhat concerned about the dosage. Apparently this child being free for a year would, it seems, indicate that the cure has been effected because these tumors usually tend to return very rapidly.

DR. HENRY SCHMITZ, CHICAGO, ILL.—It is not so much the method of treatment one uses for carcinoma of the cervix, but the early diagnosis of this condition which is all important. The success of cancer therapy stands or falls with the early diagnosis and this statement is entirely unbiased as to the surgical and radium treatment. The report published by the Cancer Committee of the American College of Surgeons in *Surgery, Gynecology and Obstetrics*, was compiled from results of treatment in the various clinics all over the country. It was based on and grouped according to the extent of the disease, the method of treatment and the end-results. The latter showed that irradiation treatment gave as good five-year end-results as surgery. Whatever progress has been made in the control of cancer has come from clinical observations and not so much from laboratory research. Therefore, I feel that Dr. Cooke deserves a great deal of credit for having studied the possibility of transition to malignancy of benign cervical conditions. That such a condition exists there is no doubt. Schiller, Culbertson and others have proved that metaplasias from benign to atypical proliferations do occur and that cancer always arises on the base of inflammatory tissue changes. It is natural to assume that if these chronic inflammatory conditions would be recognized before transition into anaplastic cells has occurred the cancer problem would be solved. The solution of the cancer problem probably depends, (1) upon the examination of every patient, postpartum, to assure a normal cervix to the mother; (2) the

treatment of any lesions of the cervix found at health examinations, which should be made at the end of the childbearing period; and (3) the examination of all tissues removed at operation whether by knife or curette. Beginning stages of cancer do not cause symptoms, hence prevention and early recognition must come from pelvic examinations requested by the physician.

DR. JOHN O. POLAK, BROOKLYN, N. Y.—What Dr. Schmitz has said is the keynote to the whole question, there is always an infection which produces this tissue hyperplasia. This was well brought out by the work done by Bailey of Manchester who examined some 800 cervices and followed them through their different stages of inflammatory change to malignancy.

Another evidence of the effect of chronic irritation is put forth by the Free Hospital for Women in Boston where the follow-up has been extremely well done. In 1400 cases of amputated and cautery treated cervices there has been no case of malignancy, while in their report of cervix cancers 91 per cent were preceded by unrepaired laceration or erosion.

When we consider the question of treatment of these conditions we must admit a gross mortality from operation. We also must admit that there are very few surgeons who can do a complete operation in cancer. And unless a complete operation is done we meet the factors that contribute to the rapid increase in cancerous growth. Anesthesia has been shown to increase the rapidity of cancer development. Trauma has been shown to cause cancer extension. Blood loss has also been shown to increase the rapidity of the growth, three conditions which obtain in every operation. Therefore, we feel that given the same type of case at the same time of diagnosis, the patient has a better chance for recovery with proper radiation than she has with operation in cancer of the cervix. This is not so, however, with cancer of the body.

In regard to Dr. Tracy's inflammatory reaction: he used radium in a cavity which was already producing an exudative protection. Consequently, with radium he further excited the inflammatory reaction, therefore it should be charged against the way it was used and not to radium.

DR. E. P. SLOAN, BLOOMINGTON, ILL.—We have had three cases die from carcinoma of the ovary after they had been treated for carcinoma of the uterus, having the classical symptoms of discharge and persistent hemorrhage over weeks and months. I would like to ask whether carcinoma of the uterus will produce those hemorrhages?

Another point that has not been mentioned is the fact that if you limit the blood supply, ligate the internal iliac arteries, the action of the radium is multiplied at least four times. The effect of deep x-ray therapy is also multiplied. There is nothing so spectacular in carcinoma of the ovary as to ligate the internal iliacs, an area entirely removed from the field of the carcinoma. So, when deciding whether one is justified in doing an operation for the purpose of ligating the internal iliac it might depend upon the question of the carcinoma of the ovary, and I am quite sure that we should at least have this possibility in mind.

DR. WALTER T. DANNREUTHER, NEW YORK CITY.—Regarding the transition of benign to malignant conditions in the case of cervical lesions, I think that most of us who do biopsies in all suspicious cases and are prepared to treat precancerous pathology properly and on a cancer basis, do not worry very much about such transformations. On the other hand, there are two varieties of malignancy of the uterine corpus that have given me a great deal of concern. The first of these is the transition of benign polyposis into a papillary adenocarcinoma and this is well exemplified by the following case record. The patient, aged sixty-five,

in excellent physical condition and with a history of three years of continuous bleeding, had been curetted twice during this period although the scrapings were discarded without microscopic examination. She was afterward referred to me and I did a complete hysterectomy. One can demonstrate in the specimen a definite plasma cell endometritis, extensive benign polyps, and a huge adenocarcinoma. All stages of the transition from an inflammatory process to a benign growth, and from a benign to a malignant tumor are evident. The split uterus exposes the carcinomatous mass. With the tumor elevated, it is apparent that the cancer mass is attached chiefly to the cornu of the fundus on each side, and that there is a large surface of benign polypoid underlying the malignant tissue. The photomicrograph of an area of endometritis shows tremendous numbers of plasma cells, and this is probably the first stage in the transition of a histologic change which began as an inflammation. Gradually there developed a hyperplasia and this was succeeded by the benign polypoid. Other sections taken from the tumor itself show the malignant cells. Although one might regard this tumor as slow growing and the malignant disease fairly well localized, pulmonary metastases were discovered soon after operation.

The other group of cases which has taxed my surgical judgment includes those fibroids in which there may be sarcomatous degeneration. In one of my cases there is to be noted a marked difference in the cut surface of one nodule as contrasted with the other. It has a dull gray surface, cuts easily with the finger nail, and its margins are fused with the surrounding myometrium. How can we determine clinically whether a fibroid tumor is benign or has malignant characteristics? In a certain number of these tumors there is an unusual friability of the cut surface, there is a lack of the usual circumscribed line of demarcation at the margin of the tumor, the heavily fasciculated areas are missing and the tumor is shelved out of its bed with difficulty. These features suggest probable malignancy and I have found that the clinical observations have been verified by the microscope in half a dozen instances. Their histopathology has been characterized by highly cellular peculiarities and a large number of mitotic figures. Evans, of The Mayo Clinic, has selected 2200 to 12000 mitotic figures to the cubic millimeter of tissue as a definite index of malignancy. I think that we may safely say that sarcomatous degeneration of a fibroid can be suspected from the gross appearance of the tumor, and we should never leave the cervix under such circumstances.

These two groups of cases constitute a serious problem in differential diagnosis at the operating table. On the other hand, precancerous lesions of the cervix can be diagnosed by taking biopsy specimens. Biopsies from the portio are innocuous.

DR. J. E. DAVIS, ANN ARBOR, MICH.—I will challenge anyone to give the data by which one could make the microscopic diagnosis of a precancerous condition. I admit that the data can be listed regarding what is perhaps a predisposing condition to cancer. But the finding of certain conditions that many have been convinced were precancerous appearances, were conclusions reached after finding in some part of the tissue examined definite carcinomas. However, if a large number of tissues are examined, one will find that exact duplications of these pictures can be obtained in severe, long-continued inflammatory conditions.

In regard to the selection of biopsy material, I believe that the surgeon should at himself particularly for the careful selection of the fertile area and should not pass in his tissue to the pathologist without any directions. Or, if it is convenient, he should have the pathologist with him and the two together should make the selection of the fertile area.

In regard to the use of iodine, it is certainly a help in making a microscopic diagnosis, yet the same result can be obtained with 10 per cent formalin. If one

becomes accustomed to the effects of the formalin he will be able to make better selections of the malignant areas.

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DR. COOKE (closing).—The paper on ovarian cancer reminds me of a very impressive experience of ours. We have for the past few years subjected every bit of tissue removed to histologic examination. In the first 100 specimens there were two cases of previously unsuspected cancer. I believe that these two lives were probably saved because we instituted radiation therapy promptly, and there has been no evidence of recurrence in either case. Possibly they would have gotten well anyway, because we could find no evidence of any growth outside of the completely encapsulated original lesion. We have had no such percentage since; but occasionally we do stumble on unsuspected carcinoma and in one case a sarcoma which became evident only after section of the ovary.

Our system is to slice every scrap of material that we do not intend to preserve for gross museum purposes; in the ovaries about one-sixteenth of an inch, in the fibromyomas about one-eighth of an inch. Each slice is then carefully examined and all suspicious areas subjected to histologic study. In spite of the fact that more than half of all our cases show fibromyomas, sarcoma is, for some unknown reason, extremely rare with us. We find necrosis, hyaline degeneration, etc., but sarcoma does not occur in our clinic.

Dr. Davis' challenge will not be accepted by me. I have always thought that the term "precancerous" could be bettered; but have accepted it simply because our pathologist has used it, and it has become a sort of habit with us. It is to us a condition which we think of as being more frequently a forerunner of cancer than the lesions in which this histologic change does not take place.

Regarding the last part of my paper, I should like to say that I wish the word polyp might be obliterated from the literature. Nothing disgusts me more than to have one of our graduates send in a case and report that he is sending a "polyp of the uterus." It may be a placental mole or a sarcoma or a carcinoma, but he sends it in as a polyp, and only too often has treated it as an ordinary mucous polyp. We think of the mucous polyp as an adenoma of the cervix or endometrium; and in these lesions malignant disease may, though very rarely, develop.

DR. TRACY (closing).—Dr. Polak spoke of the inflammatory reaction from the radium. It would be much better, of course, to use radium at the time of operation. I believe that the maximum dose of radium should be given at the initial treatment.

DR. TATE (closing).—In answer to the question of Dr. Sloan, in the case I reported there was no hemorrhage, no vaginal discharge; menstruation had ceased five or six years ago. I am under the impression that in a case of carcinoma of the ovary in its incipency there would be no increased flow, but that later on there would be more or less increase of the uterine flow.

DR. C. R. HANNAH, DALLAS, TEXAS, read a paper entitled **Anatomy of the Female Pelvis and Perineum in Relation to Labor.** (For original article see page 228 of February, 1930, issue.)

DR. G. D. ROYSTON, ST. LOUIS, MO., read a paper entitled **The Repair of Complete Perineal Lacerations.** (For original article see page 185 of February, 1930, issue.)

DISCUSSION

DR. P. BROOKE BLAND, PHILADELPHIA, PA.—There is probably, as the essayist states, no aftermath of labor more distressing to both patient and physician than a complete laceration of the perineum; with a complication of such magnitude

looming as a possibility in every confinement it behooves the obstetrician to employ every recourse to prevent its occurrence. While manual means of prevention are taught and I suppose routinely practiced, I am far from convinced that they are effective.

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With the presenting part distending and threatening the integrity of the pelvic floor, a free, generous, mediolateral episiotomy, in the form of a semibattledore incision, always appeals to me as the preferential plan of preventing serious perineal damage. An incision of the battledore or "interrogation point" type gives one an opportunity to laterally cast aside the bowel with its encircling sphincter muscle. The importance of making a free incision, including both the vaginal wall and the structures lateral to the anal canal, must be stressed and ever kept in mind. Failure of an episiotomy wound, failure in the sense that the bowel with its sphincter muscle suffers damage, indicates that the incision, as so often observed, was entirely inadequate. Simply incising the superficial structures of the perineum, whether in the midline or laterally is in no manner an episiotomy incision. The larger and the freer the opening is made the better, and all in all, one resembling in size and contour the paravaginal incision of Schenkhardt is the model one should follow.

With reference to the operation of perineal repair, it has been customary to class the procedure into primary, intermediate and secondary. The last named falls for the most part in the hands of the gynecologist; the first and second in those of the obstetrician. The intermediate procedure has never made an compelling appeal to me and is never practiced except under the most exceptional circumstances. Primary corrective surgery, if carried out along plain anatomical lines, as Dr. Royston has clearly demonstrated, is eminently satisfactory and, hence, should be the method of choice. If primary surgery fails, it is my custom not to become patently impulsive, and swayed into an active attitude by the importunities of the patient or her kin, but postpone interference until cicatrization is complete and then practice the so-called secondary repair.

The question of suture material is exceedingly important and Dr. Royston has shown a failure of 60 per cent in patients in whom nonabsorbable suture material was used. This observation should be quite sufficient to condemn the method. I have not used sutures of a nonabsorbable nature for more than fifteen years and in all forms of perineal surgery, primary or secondary, I employ No. 0 and No. 1 twenty-day chronic catgut exclusively. My results from this practice have been gratifying and altogether in accord with those enumerated by Dr. Royston.

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Dr. Hannah has also referred to the so-called ligaments of the uterus. For my part, I have never been able to persuade myself to believe that the so-called ligaments of the uterus acted as elements of support, save in a passive way. Why the few flaccid bands about the uterus have ever been described as ligamentous supports, I have not been able to fathom. They probably never act as stays in the true sense and all in all women probably would be able to get along very nicely had they never been designed. About the only attribute they may lay claim to is an additional excuse for the very gynecologist to widen his range of pelvic surgery.

DR. DAVID HADDEN, OAKLAND, CALIFORNIA.—I have no criticisms to offer regarding these papers except in so far as the illustrations go. I would like to point out the parts that I did not agree with. I know they are textbook illustrations, but I do not feel that they are correct. As far as the median perineotomy goes, I think it is the operation of choice. As to the danger of stretching, I think a certain degree will be of advantage, but an excessive degree will produce trouble.

As far as the repair of the complete tears is concerned, I have done a great many cases and have never had to do a second operation. I do not pay any attention to bowel movements except not to allow the patient to become constipated. I do not care if they have a movement the next day after a primary perineotomy. If I could get you to use a silkworm continuous suture without any knots, as illustrated in the deeper catgut sutures here, I think you would be well satisfied with the results. I never put a catgut suture in the immediate repairs, but occasionally do put one or two in the wall, in the posterior fascia, in secondary repairs. I never put a suture into the sphincter ani muscle alone. I use a continuous silkworm gut suture, following one up above the other. In many cases you will get considerable swelling. One of two things has to happen then, either your stitch cuts through the tissues and produces a little scar or the stitch stretches. There is probably no stretching of the stitch, so we have a certain amount of cutting of the tissues and a certain amount of seepage of the lochia where we should have had primary union. With a continuous silkworm gut suture that comes through as a straight line, not tied either inside or outside, you have a drain and any swelling that takes place does so along the stitch. In those cases you have no tendency to separation. If you cut them off on the outside, they are not difficult to remove. In two or three weeks they will fall out by themselves.

DR. H. W. SCHOENECK, SYRACUSE, N. Y.—It is needless to say that anyone attempting to practice obstetrics intelligently should know something of the anatomy of the pelvis. Without that knowledge I cannot conceive of an individual understanding the mechanism of a normal or an abnormal labor. This knowledge of the anatomy also makes us realize that it is a fallacy to expect that the so-called ironing-out process of the perineum will, in itself, avoid lacerations of the pelvic floor. The procedure does relax the parts sufficiently to allow the introduction of the hand into the vagina with ease and the extraction of the fist. The relaxation necessary to allow for the expulsion of the head can only be obtained through the natural forces of the parturient.

I believe that the lacerations which favor permanent disability are those that occur in the fascial supports higher up in the pelvic cavity, and it is these structures that are not relaxed by this procedure.

In the immediate repair of third degree lacerations, the experience which I have had is similar to that of Dr. Royston. I have used the 0 and 00 catgut in the rectal wall and have built up the structures by the same method that he has, and then have used in place of the plain catgut in the skin the twenty-day chronic catgut. The results have been most favorable.

DR. A. J. RONGY, NEW YORK CITY.—While I believe it is necessary for the student to have a proper understanding of the soft parts of the female pelvis and the rôle it plays in guiding the head through the pelvic outlet, still I feel that the soft parts of the pelvis play a secondary rôle in the mechanism of labor. In order that the student may have a clear and concise conception of the mechanics involved in labor, he must first of all have a proper understanding of the bony pelvis. A close examination of the mechanical construction of the female pelvis will immediately disclose the fact that it is not ideally constructed for the purposes of childbirth.

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Our present conception of the mechanism of labor is faulty; as long as we adhere to the old teaching of the diameters of the fetal head and their relation to the bony pelvis, the mechanics of labor will not be properly understood. We must conceive of the head as consisting of two hemispheres, and in order that labor may progress normally, the relation of the fetal head to the pelvis must be such that a hemisphere always is in a position to traverse the bony pelvis. This

can be accomplished only when there is a proper relationship of the fetal neck to the symphysis pubis. For labor to be normal, the neck of the baby must be closely approximated to the pubic bone. If for some reason angulation, removing the baby's neck from the pubic bone, takes place, labor will be difficult or delivery of the child impossible, because extreme angulation of the neck far removed from the pubic joint makes it impossible for the head to engage itself so that a hemisphere of the head will constantly descend into the pelvic basin. This is the reason why a mentoanterior may deliver itself normally, while a mentoposterior is impossible of normal delivery, for the reason that in a mentoanterior the angulation of the neck is near the pubic bone, making it possible for a hemisphere of the fetal head to engage itself at any and all points in the pelvis, while in the mentoposterior position angulation of the fetal neck is far removed from the pubic bone and very often is found approximating the promontory of the sacrum. Such a position makes it impossible for the hemisphere of the fetal head to engage itself in the bony pelvis and this is the reason why it is impossible for the fetal head to pass through the bony canal when it becomes impacted in an occipitoposterior position. The student must be told that in all head positions he must never interfere unless he is sure that a hemisphere of the fetal head can be engaged in the pelvis. Once that is thoroughly understood, the damage done to patients during attempts of delivery in malpositions of the fetal head will be greatly minimized and the fetal mortality will be greatly reduced.

DR. IRVING W. POTTER, BUREAU, N. Y.—There are two points in connection with Dr. Hannah's paper that I disagree with. The first is that the ironing out of the vaginal canal if properly done is not as he states, "illogical and non-surgical." For years it has been proved that it is of great benefit to the mother and to the child. We do not tear the tissues and of course we empty the bladder by means of a catheter before any attempt is made to iron out the vaginal canal. I would like to call attention to one thing about catheterization of the bladder before delivery; namely, that it is almost impossible to empty the bladder completely by catheter before delivery. We often think we do it but we do not. After the second stage of labor and before the placenta is delivered, by using a little curved metal catheter recently secured, we have been surprised to sometimes get from 4 to 5 ounces of urine out of the bladder when we thought we had it emptied. Secondly, I do not agree with Dr. Hannah that vaginal examinations are detrimental or dangerous and why anybody wants to introduce his hand into the rectum to meet an object that is coming out of the vagina is something that I cannot understand.

DR. EDWARD SPIDEL, LOUISVILLE, KY.—Experienced obstetricians should not only consider the anatomy but the physiology as well. I am a conservative when it comes to cutting the perineum for this reason. If you observe during the second stage labor pains how there is an alternate hyperemia and anemia in consequence of the pressure and there is a change in the perineal tissues that results in an elasticity that makes it possible for a structure that is about an inch in length and thickness to be distended to almost paper thickness without laceration, you will then realize that nature has a wonderful effect on these tissues. In consequence I like to depend upon this provision in my normal deliveries, assisting at the delivery of the head by giving a greater amount of an anesthetic in order that the head may be teased out or lifted out with forceps. If laceration is inevitable I, of course, prefer immediate episiotomy instead of the ragged laceration that one gets under ordinary circumstances. I still practice the ironing out of the perineum as shown by Dr. Potter and I also agree with him that there is no danger of infection if it is properly performed, with an abundance of sterile green soap poured into the vagina during manipulation and washed out afterward.

In this method of episiotomy we possibly do not realize that we are following the customs of the Asiatic midwives. In Siam the midwife cuts the perineum with a sharp piece of stone. In China she tears it with her long finger nails, and, of course, no repair follows.

In regard to Dr. Royston's paper I would like to make two suggestions: previous to the suturing of the torn sphincter ani, the rest of the sphincter should be thoroughly dilated. Then there would be no tension on the structures for some time to come. Then, in the puerperal state one ounce of liquid petrolatum should be administered each night, and five days later a sufficient dose of castor oil by mouth preceded by liquid petrolatum should be introduced into the rectum. Of course, the diet should be kept almost liquid in character.

DR. HANNAH (closing).—I had expected that some one would relate his experiences and discuss injuries to the bladder and trigone. This is a new field. Our thought previous to the present time has been centered on the injuries to the uterovesical fascia causing the cystocele, forgetting that injuries to the bladder may occur. These injuries have not been previously diagnosed, but these should be recognized, diagnosed and corrected. A repair of the cystocele is not always successful in restoring the physiologic function of the bladder; there may be an additional injury within the bladder which the compensatory hypertrophy of the injured muscles attempts to correct.

DR. ROYSTON (closing).—I want to emphasize just one or two points. The median episiotomy is preferable in the patient with a normal, bony outlet and a high perineum. In my first five midline episiotomies, two went through the sphincter ani. My paper is intended to bring forth the results that we had obtained and the methods that may be used by any average operator. Dr. Hadden's results are probably due to his superior skill. Apparently we do not have so many third degree tears in St. Louis as they do in Texas. The suture that he used was not tied, and he did not get the constriction due to edema that usually follows interrupted sutures. I had one patient who had been repaired with silkworm gut, and she was not able to sit without a pillow for three years until the sutures came out at a subsequent delivery.

Afternoon Session, Monday, September 16, 1929

DR. F. M. DOUGLASS, TOLEDO, OHIO, read a paper entitled **Early Diagnosis of Acute Intestinal Obstruction**. (For original article see page 196 of February, 1930, issue.)

DISCUSSION

DR. JAMES F. BALDWIN, COLUMBUS, OHIO.—We do not want to operate in these cases unless obliged to, and yet are anxious to avoid delaying until operation will be of no avail.

Two months ago I had as a patient a young woman, twenty-two years of age, who had been married three weeks. She had promptly developed tubal infection. She had been seen by a physician who had at once made the correct diagnosis. A second physician was sent for who promptly made a similar diagnosis, and the latter physician saw her several times; but the vomiting and retching, which had appeared at the beginning, persisted and it was then that I was asked to see her. She was in a most wretched condition; had been vomiting five days continuously. The abdomen was not distended, but there was tenderness over the lower abdomen and some across the upper abdomen. The tubal condition was very evident. While examining her I noticed a fine abdominal scar two or three inches long, and upon inquiry found that she had been operated upon five years before for acute ap-

pendicitis. In the interval she had been entirely well. It did not seem to me that the pelvic disease was extensive enough to explain her persistent vomiting and that the postoperative ileus seemed to be the only explanation of her condition; complete obstruction was found at operation, the obstruction being in the lower end of the small bowel. She made a prompt recovery and went home in good shape except for the tubal infection.

I have had several other cases in which the scar of a previous operation, which had been overlooked by the attending physician, explained the conditions present. In one case the operation had been made seven years previously and the postoperative ileus came on without warning. The method described by Dr. Douglass should help us immensely in arriving at such an early diagnosis as will prove life-saving.

DR. GORDON K. DICKINSON, Jersey City, N. J.—The author of this paper said he had little use for auscultation. I for years fought to have complete auscultation done in every abdominal case as a matter of routine. In the great majority of cases nothing of importance is heard, but I do believe that if a man wants to be successful in the odd case, he must accustom himself to the normal sounds, or absence of them, in every examination of the abdomen. If you want to be prompt in your diagnosis and have not the x-ray at hand you must know "how the belly sounds" in every type of case. With the symptoms negative, the finding of this tinkle will often lead one to advise immediate operation. Operate in that event before the patient has another meal. If you get this tinkle and the heart sounds can be heard here as well as in the chest you certainly have a post-operative case.

DR. S. J. GOODMAN, Columbus, Ohio.—I would like to ask whether the x-ray will show the difference between a mechanical obstruction and a paralytic ileus. This would be quite important in deciding whether one should operate or not.

DR. DOUGLASS (closing).—In a study of these cases it seemed to me quite striking that we should have 30 patients enter the hospital, 18 before and 12 after the forty-eight hour period, and lose but 4 patients, making the mortality 12 per cent. When these patients have pain, they look for relief and the diagnosis is therefore made early. On the other hand, if a patient who is in the hospital has pain, it is taken as a matter of course and as a result, two or three days are lost in making the diagnosis and this procrastination, in my opinion, makes the difference in the mortality, in these two groups.

Auscultation has not taught me much but this is probably due to the fact that I am not, as yet, efficient in its use. We do use it in every case. I believe the sound obtained is due to the amount of fluid behind the obstruction and the amount of peristalsis that is present.

As to the differential diagnosis between mechanical obstruction and ileus, the x-ray does not give us that information, but I believe in two cases it has been very helpful. In one case we did a lateral anastomosis and the patient was relieved. The other patient died and the postmortem showed that the ileus still persisted.

DR. C. G. HEYD, New York, N. Y., read a paper entitled "The Protective Role of the Liver in Abdominal Surgery." (For original article see page 203 of February, 1930, issue.)

DISCUSSION

DR. GORDON K. DICKINSON, Jersey City, N. J.—A paper of the type which Dr. Heyd has given us, which is one of a series of chemical papers he has brought out in the last two years, I think does more to elevate the profession,

make thinkers and better diagnosticians, and gives greater success with patients than perhaps many other types of paper which we are apt to hear in our society.

* * * * *

When the abdomen is opened, one should look for the type of liver described by Dr. Heyd. You can always tell with a fair degree of certainty whether the patient will have a fight or a fairly comfortable convalescence. If the liver is soft, you may be sure the patient will have an easy convalescence; if tough and fibrous, the striac running away from the gall bladder which indicates a fibrosis, the liver cells will not function well. Then one must be very careful.

DR. JAMES W. KENNEDY, PHILADELPHIA, PA.—We are beginning to look upon the liver as the master organ of the abdomen. I rarely put my fingers into the abdomen without thinking first of the liver and wondering how much I am insulting it.

Lessons in surgical gentleness should begin in the dissecting room. If the medical student is not taught to handle the tissues with respect and gentleness, he will be a traumatic surgeon later in life.

We have grown too comfortable in our surgery of the day, the anesthetic has made us so, and we are taking additional privileges with the tissues since the days of antiseptic surgery.

We often see a great arm sweeping around in the abdominal cavity examining viscera when two fingers should be enough.

Is it not so that in these antiseptic and anesthetic days that we have taken the blow and stress of the surgery from ourselves and placed it upon the patient?

Without condemning these steps in particular, I would call attention to the Trendelenburg position, the great retractors used, the excessively long incision, the excessive amount of instrumental surgery and the rubber glove, all of these factors have given excessive trauma, so at times steps of supposed progress are not what they seem.

DR. E. MACD. STANTON, SCHENECTADY, N. Y.—I want to say just a word concerning the frequency of the occurrence of the conditions Dr. Heyd has described in his paper.

Some time ago the question was asked, "What do patients die of following gall bladder operations?" Not a surgeon present could really answer the question in a comprehensive manner. I took the trouble to collect and analyze the charts of 100 fatal cases and was surprised in studying these charts to find that many of the postoperative deaths presented terminal pictures very different from those encountered following other types of abdominal operations. I want to call your attention particularly to a sharply defined group of 15 deaths in not one of which had the surgeon made any attempt to designate the cause of death. These deaths correspond very closely with conditions Dr. Heyd has just described. The clinical picture is characterized by a very high temperature beginning almost immediately after the operation and usually ending in death within thirty-six to forty hours afterward. In the 100 charts I studied, there were 15 of these high temperatures, rapid deaths which could be put in no other classification, but there were also four or possibly six other deaths that I felt might be classified in this group. Since my first study I have collected the records of a number of similar cases. I find two charts, given me by Dr. Johnson of Batavia, N. Y., where the patients were saved by being packed in ice, a most heroic treatment directed to the control of the very high temperature. These are the only cases that I have records of which have recovered.

DR. JAMES E. DAVIS, ANN ARBOR, MICHIGAN.—There is one paragraph in Dr. Heyd's paper that I think is most interesting, describing the liver in relation to pneumonias and the exudates that accompany pneumonias. It has been observed by a worker in a Detroit hospital and in my own laboratory, that the icteric index can be taken as an indicator as to whether a pneumonia case will or will not recover. In other words, in a certain number of cases the observation has been made by Elton that the icteric index drops very perceptibly as soon as the transudate or exudate takes place from the lungs. This has been used by Elton to diagnose quite definitely as to the outcome in a series of pneumonia cases which he has studied.

* * * * *

DR. FRANCIS REDER, St. Louis, Mo.—A certain number of patients operated upon for gall bladder conditions die from pulmonary complications. I know of no organ, the brain not excepted, that requires more delicacy of technical procedure than an operation on the gall bladder and bile ducts. Such deaths occur, usually from a pneumonia, and I am speaking from my own experience. And why? The operative trauma, indicated is often of a severe nature and its dire sequences are voiced through the delicate relationship of the sympathetic nervous system. If the patient is subjected to a fluoroscopic examination it will be seen that the right leaf of the diaphragm is considerably elevated and its motility markedly inhibited, unquestionably nature's effort to aid in recovery from the inflicted trauma. As a result of this right sided diaphragmatic elevation there is a circulatory stasis at the base of the lung. If this circulatory stasis is maintained for any length of time, it produces an irritation and a congestion which will gradually develop into an inflammatory condition of the lung, frequently terminating in death.

DR. HEYD (closing).—There are many points about this whole problem of liver protection that have been raised by the discussion. In my paper I did not give the details of some of the chemical work that went into this paper. A few years ago Drs. Kiemperer, MacNeal, Killian, and myself undertook an extensive study as to the pathogenesis of jaundice, and we came to the conclusion that in every case of jaundice, irrespective as to its etiology, there was very definite degeneration of liver cells. In the matter of degeneration of liver cells there is another very interesting fact, namely, that the liver exhibits no hypertrophy in other words, the sole property possessed by the liver in a biologic sense is represented in its remarkable ability to regenerate. Irrespective as to the type of systemic intoxication, whether it be that which occurs in pneumonia or the icterus of the newborn, there is essentially a liver degeneration and subsequent repair by fibrosis and liver regeneration. The moment that there is an obstruction to bile flow the liver cells in the immediate neighborhood of the obstruction undergo either a slow or rapid cytolysis. In severe abdominal infections the same pathologic process can be observed. Therefore, since the liver possesses the power of regeneration in such a remarkable degree it is only necessary for the surgeon to aid a surgical patient for the first few days after a laparotomy and thereby give the liver a chance to develop its marvelous protective and regenerative power. It is this ability of the liver to withstand trauma, surgical, toxic, or otherwise, that enables the individual patient to survive a laparotomy. The vast majority of patients that are operated upon for abdominal conditions have an adequate liver protection. It is in the debilitated, the toxic, the physically incompetent patients that we must supply that extra protection to the liver which will enable them to come through a serious operation.

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, FEBRUARY 15, 1929

DR. JOSEPH L. BAER presented **Three Specimens of Fibroid Uteri Removed by Hysterectomy, Showing Unusual Pathologic Findings.**

CASE 1.—Mrs. A. F., forty-four years old, admitted to the Michael Reese Hospital on December 28, 1928. Her chief complaint was a menorrhagia of two months' duration. W.B.C. 9800, R.B.C. 4,300,000. Sedimentation rate thirty-five minutes, then twenty and twenty-two minutes. Intercurrent saphenous thrombosis. Wassermann and Kahn tests negative. Hysterectomy performed January 8, 1929. Pathologic examination revealed a *fibroid uterus with an area of sarcomatous degeneration*. Postoperative course was uncomplicated, and the patient is now receiving deep x-ray therapy.

CASE 2.—Mrs. S. G., forty-two years old, was admitted to the Michael Reese Hospital on December 12, 1928. Her chief complaints were menorrhagia and metrorrhagia. History revealed that the patient had had a contraceptive button inserted in the cervix seven years before, and that she had gone to her physician every month until her admission to the hospital for the purpose of having this button cleaned. X-ray showed this button above the cervical canal. Complete hysterectomy was performed. Pathologic examination showed an *intramural fibroid, and the metal button impacted at the internal os*. The sedimentation rate was forty minutes.

CASE 3.—Mrs. F. S., forty-three years old, entered Michael Reese Hospital on December 19, 1928. Her chief complaints were pain in the back and menorrhagia. Complete hysterectomy was performed. Patient developed an anuria for ninety-six hours postoperatively. Pathologic examination revealed a *fibroid uterus with epitheliomatous changes in the cervix*. In the later postoperative course, a ureterovaginal fistula developed. Patient is now receiving deep x-ray therapy. Sedimentation rate was seventy-five minutes.

In the first case amputation was made very low in the cervix leaving a short cervical stump. The stump was a hard fibrous cord, almost cartilaginous, white and avascular. It was deemed advisable not to remove the stump.

In the second case the cervical stump was removed because of the fear that a pelvic cellulitis or a sepsis might develop, since this contraceptive button had already set up a chronic endocervicitis.

In the third case we tried to do the Richardson technic for complete hysterectomy but met with considerable difficulty. The patient had an anuria for ninety-six hours, then began voiding and on the ninth day urine appeared vaginally. Whether the anuria was reflex on one side with a broken down ureter on the other side is difficult to say. It is true that the ureter is very resistant to malignant invasion, and so we are charging the ureterovaginal fistula to operative trauma.

DR. J. P. GREENHILL reported a case of **Ruptured Corpus Luteum Cyst and Unruptured Hematosalpinx in a Nulliparous Woman.**

Patient was twenty-one years of age, had been married four years, and was admitted to the Cook County Hospital because of vaginal bleeding. Her last regular menses had begun September 17. On October 23 she began to bleed again, and this

continued until November 20, the day of operation. On October 20 and 21, sharp pain was felt in the left lower quadrant. There had been morning nausea for four weeks and itching of the breasts for two weeks. The past history was negative. There was tenderness in the left iliac fossa. Vaginal examination revealed a nulliparous outlet, a long, hard, smooth cervix, and a slightly enlarged, anteverted and movable uterus. There was no Chadwick or Goodell sign, but a suggestive Hegar sign was present. The right adnexa were slightly enlarged and tender, and on the left side was a very soft, cystic mass about 5 cm. in diameter. This ruptured as soon as it was touched. A diagnosis was made of accidental rupture of a corpus luteum cyst or ectopic pregnancy. At operation a few ounces of dark blood were found in the peritoneal cavity. The left adnexa were exposed and revealed a thickened tube and a collapsed corpus luteum cyst. These were removed. When the right adnexa were exposed, a typical unruptured tubal pregnancy was seen. This tube was also removed.

The corpus luteum cyst showed hemorrhage, chiefly in the wall between the outer coat and the wavy layer of lutein cells. The tube attached to the cyst showed mild salpingitis. The right tube when sectioned showed extensive hemorrhage, chiefly within the lumen. There was evidence of a number of distinct hemorrhages at different times. The tube wall was very thin and the mucosa compressed. There was evidence of mild salpingitis, but no decidua or sign of an ovum could be found. There may, however, have been a young ovum which reached the stage of implantation only and then degenerated or was destroyed. The interstitial portion of this tube contained numerous arteries and much intramural hemorrhage.

Dr. ROBERT M. GRIGER reported a case of Spindle-Celled Sarcoma of the Uterus.

Patient, aged seventy-six years, entered the Evanston Hospital, August 20, 1928, complaining of irregular bleeding, a palpable mass in the lower abdomen and chronic constipation.

She had been "perfectly well" until February, 1928, when she became aware of the increasing size of her abdomen. She consulted her physician at this time and was advised of a pelvic tumor which should be removed. Being very anxious to go to Europe she decided to take the risk of postponing the operation until after her trip.

During her visit in Europe she began to notice a slight "spotting." Her weight increased seven pounds, and for the last seven weeks she had severe constipation. At times she felt that she was passing blood in her stools. The vaginal bleeding increased in frequency and amount. Four days before admission the patient had what she called quite a "severe" hemorrhage.

The only abnormality found was an irregular, hard, fixed mass which filled the lower abdomen to the umbilicus. A blood count taken the day of operation, August 20, 1928, showed the hemoglobin 54 per cent; R.B.C. 3,079,000; W.B.C. 8900. The urine showed a small amount of albumin and a few hyaline casts. A diagnosis was made of a degenerating fibroid uterus.

The abdomen was opened by a midline incision from the symphysis to the umbilicus, through which the greatly enlarged soft uterus was delivered. It appeared and both tubes were atrophic. The right ovary was cystic. About 300 c.c. of blood-tinged fluid were found in the peritoneum. There were some dense adhesions about the attachments of the uterus and the left ovary. The latter was enlarged to the size of 8 by 5 by 3 cm. A panhysterectomy was done with but little difficulty. A diagnosis was made of spindle cell sarcoma of the uterus with necrosis and hemorrhage.

The patient's recovery was normal, and she was discharged on the twentieth postoperative day, September 9, 1928.

Since this time she has fallen and broken a hip bone. This was united, and she was able to walk on the leg before she died, apparently because of metastasis which produced an ileus.

DR. HENRY SCHMITZ presented an x-ray plate of a case of **Bicornuate Uterus and Left Tubal Closure in Which Lipiodol Was Retained for Three Months**, as shown in a second picture. No discomfort to the patient resulted.

DR. JOSEPH E. F. LAIBE, by invitation, read a paper entitled **A Discussion of the Common Urological Lesions in Gynecology**. This was discussed by Drs. Schmitz, Heaney and Paddock.

DR. GEORGE W. BARTELMIEZ presented a paper entitled **Some Factors Involved in the Process of Menstruation**. (To be published in a later issue.)

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, MARCH 15, 1929

DR. CHARLES S. BACON reported a case of **Fetal Death Following Extensive Infarction**.

This patient consulted me in the early part of her pregnancy, and because of the size of the uterus I made a diagnosis of twin pregnancy. She was seen every two or three weeks until the twenty-sixth week. At this time the size of the uterus seemed only about normal for a single pregnancy. In the last month of pregnancy she developed a slight toxemia, with blood pressure 150 systolic, some edema and very few casts.

She was delivered by a perfectly normal labor. At delivery it was discovered that there was a second child which was dead. The length corresponded to about the twenty-sixth week of gestation. The cord was nearly completely severed, which was evidently the cause of death. The placenta that adjoined this child contained numerous infarcts. The questions that might be of interest are, were the infarcts the result of the death of the child, or was the death of the child due to the infarcts? Also, is it at all likely that the death of the child had anything to do with the toxemia?

DR. W. McI. THOMPSON reported a case of **Fibroid of the Uterus Removed by Myomectomy During Pregnancy**.

This patient is thirty-five years old, the mother of one child. When she was four months' pregnant, she had a large fibroid tumor on the right side of the uterus, spreading out into the broad ligaments. Because this was blocking the pelvis I did a myomectomy. She went to term and was delivered by cesarean section. With the exception of a slight temperature reaction for a few days she made a good recovery. Two years later she complained of difficulty in urinating and of some

pain in the ascending colon. It was thought that it was best to laparotomize her and clear up these adhesions. I could not find the myomectomy scar, but there were some adhesions of the bladder to the cesarean section incision.

Dr. ALFONS R. BACON (by invitation) read a paper entitled *A Comparative Study of the Anterior Hypophyses in the Pregnant and Nonpregnant States*. (For original paper see page 352.)

DISCUSSION

DR. C. S. BACON.—There is still a difference of opinion as to the nature of this anterior hypophysis hormone. Thalmeyer, of Vienna, claims that the anterior hypophysis acts similarly to the female sex hormone. This is in contradiction to the findings of Zondek and Asehheim. It is a rather unusual finding that there is a hormone in the hypophysis of nonpregnant animals. The first question that would arise is, Are the observations accurate and of sufficient number to justify the conclusion? The number, sixty in each class, is not large. As to the accuracy of the observations, I think that can be accepted because any work coming from the laboratory of a man like Friedl can be considered accurate. The conclusion that the anterior hypophysis hormone may not be the only source, is one that must be settled by further observations.

DR. A. J. GARLSON.—I wish to raise a question in connection with the discussion regarding the relative of this vaginal smear for the anterior lobe hormone. Dr. Bacon left the impression that in the vaginal smear of mice we have a post-estrus product that is a hypoid. It is a hypoid in that we have these cellular changes, but what more do we mean. Beadle made the statement that reactions are non-specific. Many of you recall that Laqueur of Holland obtained something from the normal male urine which when injected into the rat or mouse produces the vaginal reaction of Allen and Doisy and Evans. The other thing is the largely negative results of clinical data on these products overcoming the hypovarian syndromes in women. The most reliable thing is the work of Corover and Allen, who have obtained results in a few cases. So far as I know, it is the follicular hormone which unquestionably produces this reaction. The vaginal smear has been very uncertain in the desired clearing up of hypophysal symptoms in women. That the anterior lobe is necessary for the growth and life both of testicles and of ovaries is well established. That the implantation of the anterior lobe will produce sexual prematurity is also understood, but I think we should go a little cautiously in interpreting this vaginal cellular reaction in rats and mice as a necessary result of normal ovarian function in women. As to the scarcity of material, the follicular hormone of Allen and Doisy, put up by Squibb, has been withdrawn from the market. Apparently, Squibb was not able to produce this follicular hormone in sufficiently stable form. They have a fluid produced from the amniotic fluid of rats which, when assayed, produces folliculin. It is said to be good not only for amenorrhoea but for menstrual headaches and obesity. However, headaches do not necessarily mean ovarian hypofunction.

DR. ALFONS R. BACON (closing).—The hypophysal hormone will work just the same in the male as in the female. The hypophysis is an asexual organ and is an activator of both sexes and will work on both sex glands. That is why it should produce estrus in the female. The quantity of the hormone in the urine of men and nonpregnant women is very small. In the pregnant woman quantities of less than 1 c.c. will produce

estrus. Professor Stoeckel had a hydatidiform mole in which he found an extra large amount of this hormone which produced estrus in the infantile mouse with only 0.1 c.c. After the removal of the mole, the patient continued to show this hormone, until she developed a chorionic epithelioma in which the pituitary hormone could be demonstrated in large amounts. This patient, like most mole cases, had large cysts of the ovary, which were very similar to the pseudocorpora lutea produced by excessive implantation of the anterior hypophysis. The recent work by Fleischer showed cyclical changes in the vaginal flora which corresponded with the estrus changes.

DRS. LOUIS RUDOLPH and A. C. IVY read a paper entitled *The Physiology of the Uterus in Labor; an Experimental Study of the Dog and Rabbit.* (For original paper see page 317.)

DISCUSSION

DR. A. J. CARLSON.—Unless my memory fails me, there are some observations by the Germans that normal labor can occur in the dog with the lumbar and sacral nerves destroyed, of which this work is a direct confirmation. It looks to me as though the uterine horn of the dog is very much like the colon or the whole large bowel in the dog. I have recently been studying the colon in the dog and have observed the feeble contraction of the musculature of the uterine horn of the nonpregnant dog on stimulation of the main sacral sympathetic. It is nothing like the vigorous contraction obtained in the urinary bladder. The phenomenon as I see it is this: The nature of the response obtained from the hypogastric depends on the condition of the peripheral mechanism at the time. The action of the hypogastric is supposed to be mostly inhibitory. If the large bowel is quite dilated, contractions will result from stimulation of the hypogastric nerve. If the large bowel is constricted, in mild tonus, there is no longer a pure inhibition of the hypogastric. I have obtained nothing but motor afferent impulses from the sacral sympathetic. Most of the fibers of the sacral sympathetic descend over the entire large bowel, and from the hypogastric we can obtain either a motive or inhibitory effect.

DR. N. S. HEANEY.—I believe that adrenalin causes a contraction of the uterine muscles but causes a relaxation of the musculature of the intestine. Clinically, Noyes, of Heidelberg, twenty years ago before pituitrin had been thought of, gave adrenalin to control postpartum hemorrhages, and it worked successfully.

DR. IVY (closing).—We did not intend to give the impression that the placenta or products of conception were responsible for the hypertrophy of the uterus, but they are responsible for the molecular reaction of the uterus at the ampulla. It may be responsible for the hypertrophy, but we have not studied that. We still have to study the hypertrophy of the uterine musculature and have contemplated cutting the contraction band about the orifice of the horn instead of between the ampullae to see what would happen and to conduct further studies to see whether it is a sphincter. Though our evidence up to the present time suggests that the vaginal uterine reflex is a reflex in the cow, we cannot draw such a conclusion at this time. It appears to be so from the experiments we have done. The represented effect definitely is from the vagina.

The action of adrenalin on the uterus varies in different animals, according to the state of the uterus. For example, the virgin uterus of the cat is relaxed by epinephrin, but the pregnant uterus is contracted. In the dog adrenalin definitely inhibits the pregnant and postpartum uterine musculature. Laibe has studied the

effect of epinephrin on the human uterus and has reported contractions. The work we have done on the dog and rabbit is preliminary to work on the monkey. We cannot argue from the dog and rabbit to the human being. Rucker reports in a recent article three cases in which the contraction rings were relaxed by epinephrin. I think the most important contribution we have made so far is studying the effect of the drug on the dog's uterus in situ.

DR. A. J. CARLSON.—Apropos of Dr. Heaney's question, I would like to add this to Professor Ivy's remarks on the action of epinephrin in different species. I found in animals which are not pregnant that the same dose of adrenalin will relax a cardiac sphincter which is contracted.

CHICAGO GYNECOLOGICAL SOCIETY

MEETING OF JUNE 21, 1929

DR. ALFRED J. KOBAK, by invitation, read a paper entitled, *Fetal Bacteremia: A Contribution to the Mechanism of Intrauterine Infection and to the Pathogenesis of Placentitis.* (For original article, see page 299.)

DISCUSSION

DR. JOSEPH L. BAER.—If the vaginal route of infection proves to be an overwhelming source of organisms that cause eventually the death of the fetus in utero, perhaps a more active handling of the birth canal in early labor or just before the onset of labor may or may not be justified. Some workers have used mercurochrome in the vagina before the onset of labor. Their figures seem to point to a reduced maternal morbidity by one-half. If there is a chance of lowering the maternal morbidity in the puerperium, it may be worth while as a prophylactic agent. I would like to hear from the Doctor in closing, as to the route of the infection, whether it is from fetus to placenta or from placenta to fetus.

DR. CHARLES B. REED.—I have been particularly interested in this paper on account of an instance which I reported before this Society a year ago, where an infant was born with a Streptococcus hemolyticus infection from which we cultured the true organism. At that time we did not have this material to guide us and we were rather uncertain as to the method and means of infection. This paper is extremely valuable in showing us how these cases can develop, how they do develop, and how much evidently they do develop before we have any idea of their presence. It seems to me in the light of this research and in the light of my own findings at Wesley that a great many cases of infection in utero have been passed by without significance on the part of the attendant or have been regarded as post-putreferal infections when in reality they can be traced to infections of the blood or intruterine infections.

DR. J. P. GREENHILL.—About six years ago I had a very interesting case bearing on the subject under discussion. After three unsuccessful attempts to induce labor with quinine and castor oil, the patient had a bag induction. The baby was delivered with little difficulty with the Kielland forceps. The patient developed a temperature of 103°. The baby had a very bad odor and a temperature of 103° for several days. We found bacteria not only in the maternal decidua but also in the stroma and in the blood vessels of chorionic villi. The extension was through the maternal cells into the blood vessels of the umbilical cord.

DR. N. S. HEANEY.—A considerable percentage of cases that I have watched where there have been habitual abortions have been due to an endocervicitis and marked changes in the cervix. A goodly number of these patients have been brought successfully through pregnancy after their cervicitis has been eradicated.

DR. A. F. LASH.—The important thing in the study of infection is to find out whether it is more of the body's reactions than the presence of bacteria which is responsible. In order to say that infection is really present one will have to have clinical evidence as well as pathologic evidence with regard to infection. There is a normal reaction that has to be differentiated from a bacteriologic.

DR. KOBAK (closing).—Dr. Baer is referring to the recent work of Wohlwill and Boek, who studied five cases of placentitis that occurred in fetuses of three to five months' gestation. These contributors believe that the placenta is involved secondary to a fetal bacteremia. I do not agree with this concept, especially if the organisms have ascended from the vagina. In these cases, the placenta is involved secondary to an amniotic water infection although the fetus may be infected at the same time. Necropsy studies of the viscera of four fetuses fail either to reveal the presence of organisms or any definite reaction therefrom, although their placentas showed marked inflammatory changes.

Answering Dr. Greenhill's discussion, the placentas were studied not only where the blood culture was positive but in all cases of prolonged labor or where the membranes were ruptured unduly long.

I fully agree with Dr. Heaney's concept. I am sorry that a study of the cervix was not included in this work.

In answer to Dr. Lash's discussion the fetal bacteremias are not in themselves regarded as evidence of infection. They are transient and usually give no clinical manifestations. Ikeda was able to reproduce the picture of placentitis by injections of *Staphylococcus aureus* vaccines, and weak solutions of acids and alkalis into the amniotic cavities of guinea pigs. The morphologic picture of placentitis indicates without doubt that chemotaxis is a big factor.

DR. W. C. DANFORTH AND DR. R. M. GRIER presented a paper entitled, **The Treatment of Fibroids. Based on a Series of 233 Cases.** (For original paper see page 367.)

DISCUSSION

DR. CAREY CULBERTSON.—This paper shows that fibroids uncomplicated have been cured with a mortality that is extremely small. I presume this is a series of consecutive cases in which the diagnosis was fibroid and in which treatment was undertaken for fibroid, and that they must have been free from a large proportion of the complications which are seen a great deal in some clinics.

I thoroughly approve of Dr. Danforth's technic as far as management of the cervix is concerned. Some years ago after having seen three or four carcinomas of the remnant of the cervix, I decided that all cervixes should be taken out that showed any pathologic changes. I have modified my attitude toward that in recent years and do not do as many total hysterectomies as formerly, because I have learned to respect the ureters. No ureteral damage has followed subtotal abdominal or vaginal hysterectomy.

I think myomectomy is to be used only in selected cases where the patient is a young woman, where the tubes and ovaries are satisfactory and where the uterus can be left in such condition that it will stand pregnancy.

DR. G. DE TARNOWSKY.—I am glad to hear that Dr. Danforth and Dr. Grier are using the rubber dam instead of laparotomy sponges. I think it is a step in advance. I am surprised they are not using ethylene. While ether gives a more complete relaxation, if you give ethylene and just add a little ether while removing the uterus, you will find that the postoperative sequelae will be greatly simplified.

DR. N. S. HEANEY.—One thing that struck me in the paper was that the essayists gave radium to one patient out of four. I do not think it is right to place an age limit for the use of radium.

There is one point in the technic in which I differ from Dr. Danforth and that is, cauterization of the cervix at the time the supravaginal hysterectomy is performed. I feel that this adds somewhat to the patient's morbidity. Five years ago I was rather enthusiastic about complete abdominal hysterectomy. It seemed to increase the mortality rate, but I am now doing more and more vaginal operations. DR. EMIL RIEB.—In gathering statistics on fibroids it makes a great difference whether the operation is done on private patients or on patients such as come to the County Hospital. One thing to which little attention has been paid is the size and weight of the fibroid. It makes a great difference whether you take out a uterus containing a three-ounce fibroid or whether it weighs ten or twelve pounds, as was common years ago. There are certain complications inherent on the size of the fibroid which are important for the outcome of the case. The blood supply of a twenty-pound fibroid is different from the circulation and blood supply of a three-ounce tumor. It would be interesting to hear, for instance, a comparison of the average size of fibroids removed at the County Hospital with those removed from patients living in the environments of the essayists.

DR. GRIER (closing).—In answer to Dr. Culbertson, this was a consecutive series and no cases have been discarded. Most of the work has been done by Dr. Danforth and the men who do nearly all the gynecologic work at the Evanston Hospital, though there have been some other operators as well. As far as the cervix goes, Dr. Danforth has frequently done a plastic on the cervix where there has been a chronic endocervicitis.

Regarding the anesthetic, Dr. Danforth has tried ethylene and nitrous oxide and has gone back to ether because he believes that he gets more relaxation.

BALTIMORE GYNECOLOGICAL AND OBSTETRICAL SOCIETY

FIRST MEETING MAY 18, 1929

DR. ARTHUR H. CURTIS, III. (by invitation) presented a paper entitled **Some Special Features of Pelvic Infections**, in which he reviewed his work in this field, as follows:

In 1921, after five years' study on the bacteriology and pathology of fallopian tubes, obtained at operation from approximately 200 patients, I found seventeen that happened to be tuberculous. From the study of these seventeen pairs of tuberculous tubes, we learned a number of things which had not only been unknown to me but which appeared to have been entirely overlooked in the medical literature. There were points of great interest, such as the frequency of calcareous deposits, the pallor of the tissues, the fact that the ambrage of the tubes remain open in about 50 per cent of the cases, peculiar rigidity of adhesions, etc.

In 1914 I interested myself in a study of leucorrhœal discharges. As the result of three years of rather continuous application to this one subject, I decided very definitely that leucorrhœal discharges did not come from the body of the uterus, that the chief source was the cervix. When I saw on the operation books that 50 per cent of the operations were "D and C," I was very much interested to learn that the chief indication for a "D and C" was chronic leucorrhœa from the body of the uterus. Even as recently as 1919, "dilatation and curettage" was seen on the operating room books almost as frequently as all other operations put together. Now we have come to realize fully that curettage of the body of the uterus is of no value in the treatment of leucorrhœa, that chronic infection of the body of the uterus is uncommon, and that "chronic endometritis" is likely to be wiped off the books as a clinical entity.

In connection with this work we made a study of a series of 118 uteri, with entire removal of the lining of the uterus above the cervix. The tissue was cut up, ground thoroughly and cultured. And we found that there is almost never a chronic endometrial infection.

I wish to emphasize what possibly all of us have considered in a somewhat abstract way, that probably the underlying factors in recovery from all infections, except those curable by specific treatment, are, first the *establishment of thorough drainage*; second, *rest*, and third, *the avoidance of reinfection*. Having carried out these three principles, I can recall few instances in which an infectious disease has not cleared up.

I believe that one of the underlying reasons why chronic discharge from the vaginal canal does not cease is because there is a failure of drainage. I believe there are two types of interference with cervical drainage—one, a *gross* interference due to granulations or strictures of the canal, the other is a *microscopic* interference with drainage. I am of the opinion that chronic leucorrhœa of cervical origin fails to disappear, if there is no gross obstruction of the canal as a whole, because there are microscopic pockets with insufficient drainage. The value of the electric cantery in these cases lies in the fact that it produces a shrinkage of the tissue, not a complete destruction but a shrinkage, so that there is sufficient drainage of the microscopic foci of infection.

In this connection I wish to emphasize certain factors of interest in the etiology of "idiopathic" infections.

1. In cases with continuous purulent leucorrhœal discharge, approximately one-third yield numerous streptococci on culture of the leucorrhœal material. Those patients who develop serious infection after labor, without history of instrumentation, usually give a history of preceding chronic purulent leucorrhœa, and in addition reveal a broad ligament tear which extends upward into the cellular tissues.

2. A second point in connection with the bacteriology of the uterus is concerned with operations. If a patient with a normally healthy uterus, one which is bacteria-free, is subjected to diagnostic curettage, it is impossible to avoid introduction of some bacteria into the uterine cavity. This accounts for the fact that although an abortionist can enter the clean uterus once almost with impunity, if he invades a second time there is grave danger of producing serious infection. The uterus is normally free from bacteria above the level of the internal os except in acutely infected cases.

In confirmation of this clinical experience, our study of the entire endometrium, ground after removal from a large series of patients, revealed no infection; but when a diagnostic curettage had been performed a week or ten days prior to hysterectomy, it was possible in the majority to find histologic and bacteriologic

evidence of a moderate acute endometritis. This I discovered as early as 1918, and I have learned since then that if one does a preliminary diagnostic curettage and follows it a week later by a supravaginal removal of the uterus, there is grave danger of a postoperative pelvic infection, usually of moderate severity. It is true, but often sufficient to make abdominal drainage necessary.

In conclusion I wish to speak of man as a factor in gynecology. Man is the only factor of importance in the causation of gonorrheal infection of the fallopian tubes. Why have we not realized that cohabitation with a glycey carrier of infection is the most important cause of persistence of gonorrheal tubes; that chronic gonorrheal salpingitis is usually reinfection of the tubes. I know it full well because when a woman with early tubal infection is isolated from the carrier who gave her the infection her disease tends to disappear without severe persistent pathologic changes. We would not think of malaria except in correlation with the mosquito. Man is to gonorrheal infection of the fallopian tubes what the anopholes mosquito is to malaria; and he reinfects quite as readily and quite as often.

Man as a factor concerns us in another way, in sterility. I do not wish to emphasize epididymitis infection, which is well recognized. I prefer to call your attention to such factors as interrupted coitus; how often the husband completes a hurried sexual act, the wife having insufficient time for normal physiologic action; how often the psychic factor comes in; how frequently there is an unnatural reaction because of a woman's delicate nervous mechanism, a condition which is usually overlooked by the husband and never thought of by the attending gynecologist.

I have gone so far in my thoughts about man as a factor in gynecology that I believe I have learned to evaluate the great importance of the part which he plays in pelvic infections. I have gone so far, also, in pelvic cases that I have come to this decision; whenever I encounter a definite disturbance, the nature of which cannot be determined, I make it a rule to ask the patient whether she is happily married, and endeavor also to have an intimate talk with the husband. It is remarkable how many of these cases are cleared up when we obtain a thorough understanding of the psychic background.

DISCUSSION

DR. W. S. GARDNER.—I think most of us are familiar with the fact that endometritis infection of the body of the uterus rarely occurs except in association with an infection. I remember that Dr. Kelly called my attention to that a good many years ago, and those of us who have looked over microscope specimens of material that has been removed are quite familiar with it.

The leucorrhæal discharge of the cervix is a thing which ought to be particularly emphasized, because I think very often we overlook this, which is the main source of the discharge. The infection of the tubes we know gets down in a great many instances. If you had worked in the dispensaries of Baltimore before 1892 you would have found that a very large number of definite tubal infections were not operated upon but recovered at the time; and since then of course there have been so many operations that it has been rather difficult to observe a great many of them. I believe that if you could take all of these patients who have tubal infection, especially gonorrheal infection, and put them to bed and give them care and rest, a very large proportion would recover without operation.

DR. HOWARD A. KELLY.—Leucorrhæa has been the curse of gynecology from its very inception. Going far back to the early part of the last century you find men like West and Bennett dealing with it successfully. Those who were their immediate followers put a stick of nitrate of silver in the cervix so that they

withered away the cervix and the woman was cured. My generation came along, and (but not counting myself in this) we got rid of cellulitis and put the blame on endometritis. This condition occurred and when it did I think it was almost always incidental, associated with other troubles that were major and which were covered by the diagnosis. We were fortunate when we got down to the determination that the discharge came from the cervix and the vagina, one or both. I remember one case in particular many years ago. I had been treating her a long time for cervical leucorrhoea. In one treatment, by cauterization following Dr. Hunter's bright suggestion, I wiped out the whole trouble, so that she never had to come back.

DR. THOMAS S. CULLEN.—I can agree with Dr. Curtis thoroughly as to the rarity of endometritis. In 1908, at the old Faculty Building, I remember the results of the observations of four years, coming from the gynecologic operating room in Dr. Kelly's service. At that time the endometrium was examined from every uterus. In those four years we had 48 cases of endometritis. In other words, on an average we had one case of endometritis a month.

When Dr. Kelly was working on the bladder he dwelt upon the fact that infection in the urethra with a certain amount of discharge was frequently associated with infection of Skene's duct. He would demonstrate with a drop of pus that came out of it. It was often necessary to clear up this infection to get rid of the leucorrhoea.

DR. B. P. WATSON, of New York City, presented an address abstracted herewith and entitled **What Can We Do to Improve Our Present Puerperal Mortality Rate?**

Why is it that with all our present-day knowledge the incidence of puerperal sepsis and the mortality from puerperal sepsis remains pretty much as it was before the days of Pasteur and Lister? That such is the case is amply proved by statistics.

From a study of the whole vast problem of puerperal sepsis it seems to emerge that there are two main modes of infection, one by contagion, which occurs in the same way as does scarlet fever, measles, or smallpox, and the other by direct inoculation into wounds such as occurs in ordinary surgical practice. We all know of cases of puerperal sepsis occurring in patients who have had normal deliveries without tears, and on whom no vaginal examinations have been made. To explain such cases it has been assumed that the infecting streptococcus was present in the vagina or cervix prior to delivery. We know that many pregnant women harbor streptococci in the cervix, but recent research seems to indicate that these are for the most part harmless and do not cause infection.

In the majority of infections a virulent streptococcus is in some way introduced into the uterus and genital canal during or soon after labor. It may reach there from a focus in some other part of the patient's body, such as a septic tooth, tonsil, or the respiratory passages, the throat and ear, the digestive tract. Even allowing that streptococcal infections in general are more common than they used to be (we have no way of proving this of course) the facts stated would seem to indicate that there has been no marked diminution of cases in which infection is introduced by direct inoculation of puerperal wounds.

The figures quoted seem to give us one lead at any rate as to how our present mortality might be reduced, viz., by abstaining from active interference with labor except on definite indications. By far the commonest reason for interference is the demand on the part of the patient to be saved pain and to have labor shortened. The second commonest is the inability of the doctor with all his other work pressing upon him to spend the time waiting for normal delivery. At this point I know

I am entering upon debatable ground and may say things with which many of you will disagree. I shall, therefore, take the plunge at once and get it over with. I believe that the maternal mortality in this and in every other country would be very materially reduced if the practice of obstetrics were in the hands of thoroughly trained midwives working in conjunction with and under the direction of properly trained doctors. Or to put it another way, every doctor practicing obstetrics should have associated with him one or more trained midwives who would conduct the delivery of his normal cases. I make this statement from a knowledge of conditions on this continent and in Scotland.

By a trained midwife I mean a nurse who has had a full general hospital training and who subsequent to that has had at least six months' and preferably a year's training in the delivery room, wards, clinic, and outdoor practice of a maternity hospital. With such a training she ought to be able to act as obstetric technician to a doctor. The doctor with a busy practice has his office nurse and technician who does his x-ray work, his blood counts, and his chemistry. She does these things better than he can do them. It would be physically and economically impossible for him to do them himself. A nurse can become just as expert and reliable in conducting a normal delivery as can a technician in doing a blood count or a blood chemistry.

The alternative to the trained midwife system is the provision of hospital accommodation for all obstetric cases. If such an aim were attained would it solve the problem? Does the aggregation of obstetric patients in large institutions add to the danger of contagion? I think it unquestionably does. The mere provision of hospitals is not enough. The same type of heedless midwifery can be practiced as easily in a hospital as in a home, in fact the temptation to interfere may be even greater, for the better facilities provided may give a feeling of false security.

DISCUSSION

DR. J. WHITRIDGE WILLIAMS.—I have been appalled at the obstetric maternal death rate in this country. It is the highest of any civilized country in the world, and why I cannot quite see, because when I look around at the doctors in this country and the doctors in some other countries where the mortality is much lower it is difficult to attribute it all to the doctor.

I agree entirely with what Dr. Watson says about the operative dangers. The figures of the New York State Board of Health a few years ago showed the mortality at childbirth to be lowest in the big cities of a half a billion inhabitants; next lowest in the rural communities, and highest in the towns of 50,000 to 200,000 inhabitants. Why? Because in the large cities they have good hospitals. In the country districts the woman was delivered before the doctor got there, and in the small towns every doctor thought he was as good an obstetrician as anyone else, and he often did a good deal of harm.

Cesarean section is an operation which is greatly abused in this country. The mortality is about 10 per cent. The necessary mortality is only a fraction of that. Several years ago one of my assistants thought that if the mortality of cesarean section is what I have said it is, that would account for a large part of the mortality of childbirth in this country. And I have no hesitation in saying that every year a good many thousands of women are dying of cesarean section who ought not to die. The mortality depends a good deal upon the type of person. Why this is I cannot answer. It is quite possible that in this country, with its mixed race, we have developed a type which is less able to stand childbirth than in other countries. It seems extraordinary that the Scandinavian countries have a low mortality; in Great Britain it is relatively low, lower than in Germany, and in Germany it is much lower than in this country.

Then we come to the matter of hospitals. I think the only hospitals that are worth while are the first class ones; that the average lying-in department of a hospital is a dangerous place. I know that in many hospitals things are being done by men who call themselves specialists which are absolutely wrong. In my experience as a teacher the hardest thing I have to do is to hold the men down and keep them from unnecessary procedures.

I think that in this country the first thing we want to do is to train proper obstetricians. It seems a serious accusation to me that a partially trained nurse, a midwife, can get better results in delivering women than a doctor can.

DR. FRED ADAIR, MINNEAPOLIS.—Dr. Watson's suggestions are well worthy of consideration, but one must be guided by local conditions in working out any scheme for maternal welfare or other health programs. The working out of these plans must, of course, be in accordance with certain fundamental principles.

There are many things to be considered in accomplishing a reduction of the morbidity and mortality of mothers. First, the means of reducing the maternal mortality in institutions to which maternity cases are admitted has to be carefully thought out and two or three types of institutions must be considered: first, special maternity hospitals, of which there are relatively few in this country; second, general hospitals which have a separate and distinct floor devoted to the care of maternity cases; and third, general hospitals in which no provision is made for isolation and separation of maternity cases.

One of the predominant causes of maternal mortality is infection. This constitutes the only potential danger to maternity cases which would not exist in the home for the same type of case. The danger of infection may possibly be somewhat greater in hospitals than when corresponding cases are cared for in the home. This would apply particularly to the third type of hospital, to a lesser extent if at all to the second type, and perhaps not at all to the first type.

There seems to be a special danger of infection when maternity hospitals are temporarily or permanently overcrowded so that the house staff or nursing force is hurried and the personnel too few to give the necessary attention to the detailed care of the individual patient.

A distinct menace to the hospitalized patient also exists during epidemics of infection of the upper respiratory tract, occurring among either the patients admitted to the hospital or the personnel caring for the patients. This danger exists for both mother and baby. The same danger would exist in the home if either one were exposed to carriers of these infections.

The management of toxemia of pregnancy can be better carried out in hospitals than in homes, but no hospital or other care given to advanced cases of toxemia can be as effective as care given in the earlier stages of this disease. This means that every hospital should have a trained staff which gives adequate prenatal care to those entering the hospital and thus detect early in its development the toxemia so that proper treatment may be instituted before the case has reached an advanced stage. It is true, however, that there are, and probably always will be, fulminant cases of toxemia of pregnancy which will be difficult to always detect by routine observation prior to the rapid onset of urgent symptoms.

There are, of course, many other complications of pregnancy which contribute definitely to maternal mortality, many of which are unavoidable and increase definitely the maternal and fetal hazard. Practically all of these complications can be managed better in properly equipped hospitals provided early hospitalization is accomplished.

One very serious consideration relative to hospital care of maternity cases is the constant temptation to physicians to interfere with the processes of labor by

surgical procedures. This makes an extremely serious situation and one which it is very hard to control because the management of any obstetrical case is left largely to the individual opinion of the physician in charge, whose procedures are not sufficiently checked by the hospital management.

Without wishing to criticize my fellow practitioners, it is, I believe, apparent that there are too many operative deliveries conducted in the hospitals of this country. This opinion may be erroneous, but I am inclined to believe that one of the reasons why the maternal mortality rate is lower in some of the foreign countries than in the United States is that many of their deliveries are conducted aseptically by well-trained midwives who are carefully controlled and restrained from performing operative deliveries except under very definite indications. Further, they are permitted to perform only certain types of operative deliveries and the major procedures are carried out by men well trained in the art of the obstetric specialty. While we appreciate fully the possible value of Dr. Watson's suggestion, it is very doubtful if midwives can ever be as effectively controlled in this country as they are in Europe.

Second, so far as home deliveries in this country are concerned, one has to consider those which are conducted in the cities and those which are cared for in the rural communities.

It would seem that midwives have little place in the larger centers of population in this country. In these cities, by proper organization of medical men and nurses, either private duty nurses or public health nurses, the home delivery may be so conducted that the midwife is practically eliminated, to the patient's profit. In the city of Minneapolis we have gradually reduced the percentage of deliveries by midwives to less than 4 per cent. It may be well to mention that we now have over 78 per cent of our maternity cases hospitalized. This has been accomplished by the establishment of prenatal clinics throughout the city which cooperate with the various hospitals caring for maternity cases. It has further been accomplished by the cooperation of the Infant Welfare Society in carrying out the prenatal work and by cooperation with the Visiting Nurses Association in furnishing home nursing care for obstetric patients.

To quote some statistics from Minneapolis, during the years 1925, 1926, 1927, and 1928, there were 35,583 deliveries in the city. In this group there were 217 maternal deaths, giving a rate of 6.1 per 1000 living births. Of these maternal deaths, only 140 took place after the fifth month of gestation, which makes a rate of 3.9 per 1000 living births. The deaths from infection amounted to 99 (2.2 per 1000). Of these, 56 were over five months' gestation (1.6 per 1000); in other words, 56.5 per cent of the deaths from infection occurred in cases delivered after the fifth month. The figures for toxemia show a somewhat different picture. There were 52 deaths from toxemia, or 1.4 per 1000, of which 40 occurred after the fifth month, giving a rate of 1.1 per 1000; in other words, 77 per cent of the toxic cases died after the fifth month of gestation. Deaths from hemorrhage were 21 (5.4 per 1000), of which 18 occurred after the fifth month, which makes a rate of 0.54 for the whole group and 0.5 for those after the fifth month. This means that 86 per cent of the patients who died from hemorrhage were after the fifth month.

I have also secured some statistics relative to home deliveries versus hospital deliveries in Minneapolis. In 1925 eight deaths followed home deliveries in cases over five months' gestation. Five or 62.5 per cent of these were due to infection. This makes about 23 per cent of the total deaths over five months' gestation. Of the hospital deliveries, 3 of 27 cases died from infection (11 per cent); in other words, 0.4 per 1000 of hospital deliveries died from puerperal infection while 1.9 per 1000 of home deliveries died from infection. The figures are reversed for toxemia, there being more deaths from this cause in the hospital than in the home.

In 1926, of 74 total deaths, 47 were past five months' gestation and of these 12 were classified as puerperal septicemia, of which 10 followed hospital deliveries and 2 cases after home deliveries, giving rates of 1.4 for the hospital and 0.4 for the home.

The figures for 1927 are similar, with 9 deaths from puerperal septicemia, of which 5 were from hospital deliveries and 4 from home deliveries, with rates of 0.7 and 2.0 respectively.

If the figures are combined for the three years, the rates for hospital deaths and home deaths from infection following delivery are 0.88 and 1.6 respectively. It would seem, therefore, that as deliveries are being conducted in the homes and hospitals of Minneapolis after five months' gestation, that it is safer from the standpoint of infection to have the delivery done in the hospital. It would be undisputed, I believe, that the hospital is better and safer from the point of view of all other factors which contribute to maternal mortality.

In rural communities, hospitalization is difficult or impossible and often fortunately so as these small rural general hospitals are frequently undesirable places for the proper care of maternity cases. In many sparsely settled rural communities, medical care is often inaccessible and inadequate and the care of the patient is frequently delegated to well-intentioned, but improperly trained neighbors or others who may be at hand. There is a definite shortage of properly trained midwives in the United States, in the cities as well as in the rural districts, and too often insufficiently trained doctors. Some safe and adequate plan must be worked out for the various types of smaller and rural communities, and no one plan would be applicable to all communities. The different communities should be stimulated to develop plans which meet the local needs, under the guidance of physicians and trained obstetricians.

One has, further, to consider both racial and individual susceptibility to obstetric complications. It is well known that the negro population shows a higher mortality rate from puerperal sepsis than does the white population. This may be due to racial susceptibility. There is, undoubtedly, individual variation in susceptibility to streptococic and other infections. This leads us to the very important consideration of immunity in relation to puerperal sepsis. We should attempt to determine the susceptibility of individual patients to streptococic infection in particular and, if possible, work out some method of increasing their resistance to this disease by developing in them either an active or a passive immunity.

The methods of prevention of maternal mortality may be summed up as follows: First, better and more antepartum care, with the possibility of developing some scheme of immunizing patients against puerperal septicemia. Second, more and better institutions and personnel devoted to the intrapartum hospital and home care of maternity cases, with some means of control of unjustified and improper surgical deliveries. Third, the widespread provision of proper postpartum care. Fourth, the proper development in various communities, both urban and rural, of appropriate and systematized care of maternity cases in those communities. And fifth, the minimizing of abortious and the dangers associated with the early termination of pregnancy.

DR. JAMES MASON KNOX.—Dr. Levy's results with midwife practice in New Jersey are interesting. In 3,000 cases conducted by midwives under supervision of nurses, and having doctors make physical examinations as far as possible, the mortality as reported by the State of New Jersey is nine-tenths of one per cent of live births.

In connection with those nurses to which Dr. Watson has referred, namely the Queen's Nurses in Great Britain, I have followed their work for a number of years.

In 1907 those women delivered about 56,000 women, and their maternal mortality was 1.3. They worked in connection with physicians to a large extent. In rural Maryland, as I see it, there are not enough doctors to go around. However well they are trained they cannot be present at all the deliveries. Some help must be given because we are losing 2,000 women a year, 1,000 of whom I think are lost unnecessarily.

DR. G. W. KOSMAK.—Dr. Watson's paper is somewhat epoch making in view of the recommendations he makes. I think he has a great deal of courage to come out as plainly as he has done in those recommendations, giving recognition to some sort of assistant obstetrician. I was just as strongly opposed to the midwife system years ago as anyone could be, but with a closer acquaintance with what was being done by these women in European countries, I somewhat changed my views. I agree that something must be done in this country to reduce our high obstetric morbidity and mortality rates. How we shall go about it is a question for the profession to decide in great part. I believe that in this country a second-rate system will by no means fill the bill. There is but one school of instruction for midwives in this country. Every state in the Union has laws and very stringent regulations for midwives, and yet there is practically no attempt made to teach them. On the whole the situation is most unsatisfactory. And if we as a profession decide to use the midwife we must do something for her teaching. I think Dr. Levy has done excellently in New Jersey with his midwives, but even there I and they are not the type we should favor as participants in this very, very important work.

Dr. Williams has touched somewhat upon the factors which contribute to the increased mortality in the United States. I think that several others may be added. Undoubtedly our racial stock here is not on a par with that of the Scandinavian countries, where the percentages of maternal morbidity and mortality are so very low. These women go through the process of labor easily. Moreover, even in large maternities, such as one series of 3,000 deliveries, they had just two cesarean sections, one for contracted pelvis and the other for placenta previa. I doubt whether there is any similar series in this country. Our cesarean rate is much higher, because we apparently have more complications.

Another phase that must be considered is the changed psychology as regards childbearing which is gradually affecting our American women. A number of factors have had some influence in bringing this about, among which is the birth control agitation which is sweeping the country. Ostensibly the propagandists direct their attention to the mothers of large families or the subjects of disease in whom further childbearing would be dangerous. Unfortunately their propaganda is much more dangerous. I have observed this situation over a number of years, and know that the birth-control elite gives advice in a great many cases where neither of those conditions are at hand. That is to say, in many instances the woman has either had no child at all, or she is not the subject of disease. They do a great deal to influence young women not to have children until they are supposed to be ready for them. I believe that is developing among our woman-kind a desire not to have babies until such time as it suits them and very often they get to an age where childbearing is not so simple as in the early years. It seems to me that the question of birth releases has come to be of greater importance than that of so-called birth control, and I feel certain that a study of the hospital clinics will show that there are a great many more women who apply for relief from sterility than those who desire advice against conception.

American Journal of Obstetrics and Gynecology

GEORGE W. KOSMAK, M.D., EDITOR

HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Editorial Comments

An Intensive Study of Puerperal Mortality

SINCE the end of the World War with its wastage of human life, the peoples of every civilized land and especially those of the countries which participated, have been taking an increased interest in public health and in the conservation and prolongation of life. This interest has translated itself into action in many different ways, some of them wise and some of them unwise. The mistakes have been due largely to an inadequate or inaccurate knowledge of all the factors entering into the particular problem.

This danger of generalizing and of advocating certain lines of action without full knowledge and understanding of all the data, is especially great in the fight against death and disease of puerperal origin. The problem of puerperal mortality is so difficult and the subject has so many ramifications that an enormous amount of work must yet be done. Investigations are going on in different countries and in different communities of the same country. A thorough study in a large center of population such as the city of New York is therefore of moment, for aside from possible benefit to itself, it may add its quota to the mass of facts obtained elsewhere and so contribute its share to a large general survey.

Stimulated by the interest of certain members of the New York Obstetrical Society, the New York Academy of Medicine through its Public Health Committee is undertaking an investigation into puerperal mortality. The aim is to get accurate details of all the circumstances surrounding every maternal death in New York City. The questionnaire already employed by the Children's Bureau of the U. S. Department of Labor has been adopted. Besides being a very compre-

NOTE.—In response to requests from various sources, the Editors of the Journal have inaugurated a department of Editorial Comment, which we trust will meet with the approbation of our readers. Where not signed, the "comments" are by the Editors.

ensive and detailed form, it has the advantage of nation-wide use, already some fifteen States in the Union are using it as a basis for investigation, so that it will be possible to compare and contrast accurately the results obtained in New York with those from other parts of the country.

All the facts to be recorded in connection with each maternal death will be obtained by an interview with the attendant, doctor, midwife, or medical student, as the case may be. The interviewers are physicians who aim to conduct the interview with sympathy and judgment, dispelling any suspicion of inquisitorial methods but impressing upon the attendant its nonpersonal character. This interview will take place within two weeks following the death of the patient while all the details are still fresh in the memory of the attendants.

The New York City Department of Health has agreed to cooperate to the fullest extent by supplying to the Committee each week a list of the maternal deaths in greater New York. It is estimated that approximately 700 maternal deaths occur each year. If the study is extended over a three-year period, that would give a total of 2000 cases. It might be wise to extend it over five years, giving a possible total of 3500 cases. Either of these numbers should furnish a satisfactory basis from which to draw general deductions as to the factors influencing maternal mortality and should give useful information on such correlated subjects as midwife practice, private obstetric practice, and practice in the small proprietary as well as in the larger hospitals.

The value of the data obtained in this way is evidenced by the report of a similar investigation carried on over a long period of years in the small city of Aberdeen in Scotland. However, in a year in New York more information can be obtained than in twenty years in a city of that size. The projected investigation is to be highly commended.

—B. P. Watson.

The British College of Obstetricians and Gynecologists

THE self-styled but incompetent "specialist" is a menace to the public and reflects discredit upon the medical profession. The American Board of Ophthalmology and the American Board of Otolaryngology have both been functioning successfully for several years, and have accomplished much in curtailing the activities of mushroom specialists in their respective fields of practice. In this connection, one may quote a recent statement that, "the present uncontrolled status of specialization will not be permitted to continue indefinitely. If medicine itself does not regulate specialization, eventually the State will." That such comment is pertinent not only in this country but elsewhere, is indicated by the recent (September, 1929) incorporation

of the British College of Obstetricians and Gynecologists. Like our own proposed American Board of Obstetrics and Gynecology, the purposes of the College are not legislative or restrictive, but educational and constructive. Its chief objects are to encourage the study and improve the practice of obstetrics and gynecology, to grant diplomas, certificates, or equivalent recognition of special knowledge to registered medical practitioners, to give advice about courses of study and training, to maintain a Register of Fellows and Members, and to promote or oppose any legislative or other measures affecting the status of obstetrics and gynecology. The "Articles of Association" are subscribed to by nine distinguished British obstetricians and gynecologists, and they clearly disavow any intention to confer or purport to confer any legal qualification to practice obstetrics and gynecology. In fact, their aims are similar to those of the embryonic American Board of Obstetrics and Gynecologists. Our British colleagues are to be congratulated on the early fruition of their aspirations.

—Walter T. Dannreuther.

Errata

The following note was received from Prof. Johnstone after his article, *The New Physiology of Menstruation*, had been published in the February issue. (See pages 167-180.)

At the date of correcting the proofs (January, 1930), I have the complete figures for 12 months. Seven hundred urines in all were tested. In 401 the results have been controlled by subsequent information from the doctor who sent the specimens. In 387 cases the result was correct. In 14 it was said to be erroneous—a percentage of error of 3.4. In only one case was a positive result obtained in the absence of pregnancy, and of the 13 cases, in which a negative result was said to have been proved wrong, the urine was tested between 35 and 45 days after the last monthly period—i.e., within a fortnight of the first period missed.

In one case of chorionepithelioma we have obtained a positive result.—R. W. J.

The illustration in the article by Williams, *A Case of Accessory Clitoris*, page 117, January issue, appeared upside down.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAM, M.D., CHICAGO, ILL.

White House Conference on Child Health and Protection

The White House Conference on Child Health and Protection is a somewhat loosely knit extra-governmental organization which is sponsored and set up by the administration at Washington. It has the strong personal endorsement of President Hoover who hopefully anticipates important results for the present and future generations of infants and children of this country. It had its beginnings during the summer of 1929 and will culminate in a more or less formal assembly for a Conference in the fall of 1930. The general chairman of the Conference is Secretary Ray Lyman Wilbur, M.D., and the Director is H. E. Barnard, Ph.D.

The purposes and procedures have been announced briefly and are as follows:

Purposes:

(1) To study the present status of the health and well-being of the children of the United States.

(2) To report what is being done for child health and protection.

(3) To recommend what ought to be done and how to do it.

Procedures: Through committees of persons qualified in particular fields.

(1) To gather information.

(2) To compile the reports.

(3) To prepare recommendations for presentation to a general conference to be called when the survey work is completed.

The general scheme of organization consists of the President's Planning Committee which is made up of the following appointees:

Ray Lyman Wilbur, M.D., Secretary of the Interior, Washington, D. C., Chairman.
James J. Davis, Secretary of Labor, Washington, D. C., Vice-Chairman.
H. E. Barnard, Ph.D., Washington, D. C., Director.
Edgar Rickard, New York City, Treasurer.

William F. King, M.D., Indianapolis, Ind.

Henry Breckenridge, New York City.
Mrs. Louis H. Birmingham, St. Louis, Mo.

Bailey B. Burritt, New York City.
Frederick P. Cabot, Boston, Mass.

Frank Cody, Detroit, Michigan.

James Guzens, Washington, D. C.

S. J. Crumblin, M.D., New York City.
Hugh S. Cumming, M.D., Washington, D. C.

Lee K. Frankel, Ph.D., New York City.
William Green, Washington, D. C.

Samuel McC. Hamill, M.D., Philadelphia, Pa.

Mrs. F. Louis Shide, New York City.
William F. Snow, M.D., New York City.
Louise Stanley, Ph.D., Washington, D. C.
French Strother, Washington, D. C.

Florida.

Mrs. Raymond and Robins, Brooksville, Mich.

Mrs. Elizabeth A. Perkins, Ann Arbor, Mich.

Mrs. Bina West Miller, Port Huron, Mich.

Mrs. William Brown Meloney, New York City.

Julia Lathrop, Rockford, Ill.

Gertrude B. Lane, New York City.

There is an executive committee consisting of members of the President's Planning Committee which is composed of the persons named below:

- Ray Lyman Wilbur, M.D., Secretary of the Interior, Washington, D. C., Chairman.
 H. E. Barnard, Ph.D., Washington, D. C., Director.
 Grace Abbott, Washington, D. C., Secretary.
 Hugh S. Cumming, M.D., Washington, D. C.
 French Strother, Washington, D. C.

The fundamental organization consists of a grouping of various committees with allied interests into Sections. No hard and fast lines can be drawn between the proposed activities of either the Sections or Committees, as there is a definite interlocking and overlapping of interests which will have to be harmonized by liaison committees or personnel.

The Sections with their component Committees and the Chairman of the Sections and Committees are shown in the following outline of organization:

SECTION I. MEDICAL SERVICE. Samuel McC. Hamill, M.D., Philadelphia, Pa.

- A. Growth and Development, Kenneth D. Blackfan, M.D., Boston, Mass.
- B. Prenatal and Maternal Care, Fred L. Adair, M.D., Chicago, Ill.
- C. Medical Care for Children, Philip Van Ingen, M.D., New York City.

SECTION II. PUBLIC HEALTH SERVICE AND ADMINISTRATION. Hugh S. Cumming, Surgeon General, Washington, D. C.

- A. Public Health Organization, E. L. Bishop, M.D., Nashville, Tenn.
- B. Communicable Disease Control, George H. Bigelow, M.D., Boston, Mass.
- C. Milk Production and Control, H. A. Whittaker, Minneapolis, Minn.

SECTION III. EDUCATION AND TRAINING. F. J. Kelly, Ph.D., Moscow, Idaho.

- A. The Family and Parent Education, Louise Stanley, Ph.D., Washington, D. C.
- B. The Infant and Pre-school Child, John E. Anderson, Ph.D., Minneapolis, Minn.
- C. The School Child, Thomas D. Wood, M.D., New York City.
- D. Vocational Guidance and Child Labor, Anne S. Davis, Chicago, Ill.
- E. Recreation and Physical Education, Henry Breckinridge, New York City.
- F. Special Classes, Chas. S. Berry, Ph.D., Ann Arbor, Mich.

SECTION IV. THE HANDICAPPED. Prevention, Maintenance, Protection, C. Carstens, New York City.

- A. State and Local Organizations for the Handicapped, Mrs. Kate Burr Johnson, Raleigh, N. C.
- B. Physically and Mentally Handicapped, Wm. J. Ellis, Trenton, N. J.
- C-1. Socially Handicapped—Dependency, Homer Folks, New York City.
- C-2. Socially Handicapped—Delinquency, Frederick P. Cabot, Boston, Mass.

Sections I and II are of especial interest to members of the medical profession. Section I is of particular importance to those who are engaged in the practice of medicine and who have any active interest in either pediatrics or obstetrics. The second section has greater interest for those who are engaged in public health activities.

It will be noted that there are three committees in Section I. A. Growth and Development, which covers a consideration of these processes from conception up to the eighteenth year. The work of this committee will be to assemble and analyze data, set up normal standards and note the variations and their significance. This covers an enormous field and is a work of tremendous importance to both the medical profession and the laity.

The following purposes of the committee have been enumerated for consideration: "(a) To produce an authoritative appraisal of existing data descriptive of normal growth and development and of the obstacles which may be imposed by disease or socio-economic circumstances. (b) To indicate the places where our data are lacking, inadequate or discontinuous and to point out the most fruitful pathways in the approach to fuller knowledge. (c) To judge these facts and to place them in a proper perspective from the standpoint of their usefulness in the protection of child health."

The second committee in the Section, B. Prenatal and Maternal Care, is of special interest to readers of this Journal. It should be remembered that the primary purpose of the Conference is child health and protection. The welfare of the mother is secondary. It is understood that as a rule a child with a disabled mother or no mother is a handicapped child. This extends the activities of this committee to include the whole problem of maternity in its effect on both mother and child.

The main subcommittees of this obstetric committee are five in number and deal with fundamental conditions. Education of those having to do with maternity is considered to be one of the most fundamental problems and is turned over to subcommittee number one.

The second subcommittee deals with the means and methods of care for the fetus and mother in different racial, social, economic and geographic situations. The third subdivision has as its function the accumulation of data from various organizations which are interested in maternity problems. This information should include facts which they have assembled, work they have done, are doing and plan to do.

The fourth major activity has as its main object the study of factors and causes entering into the causation of morbidity and mortality of fetus, newly born and mother. The fifth subcommittee deals with the basic sciences in their relation to reproduction and has as its main objects the supplying of fundamental information regarding the organs and processes of reproduction in relation to the bodily economy; the studying of the possibilities of closer correlation of teaching of these branches as between the fundamental sciences and the clinical subjects of obstetrics and gynecology. The third object is the blocking out of fruitful fields for investigation in which the cultivation of knowledge would produce fruitful results for child health and protection.

C. Committee on Medical Care for Children. "This Committee has large functions and wide scope and includes all medical activities which have to do with infant, pre-school and child life. Certain phases of the work belong to the class of 'specialties' and with this in mind six special subcommittees have been organized to submit a program to the Committee and, upon its approval, assist in carrying on the collecting of information as to what is being done for the health and protection of children, and to study what ought to be done and how."

This rather cursory statement should give the reader some idea of what the White House Conference on Child Health and Protection has for its objects. The one committee dealing with Prenatal and Maternal Care should be of great interest to the readers of this Journal and all others who are in any way in touch with the problems of maternity. It is a national and even a world-wide problem and valuable ideas should be welcome from any source. It will be impossible, especially in the short time at disposal, to make universal contacts, but they should be as extensive as possible.

In later issues of the Journal the work of the Conference will be described as this is developed.

FRED L. ADAIR.

Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

Review of New Books

IN SCOPE and interest the contents of this volume, *The Female Sex Hormone*,¹ exceed the promise of its modest title. The first and longer of the two parts into which the monograph is divided is devoted entirely to the experimental or investigative aspects of this subject. Without such a foundation, however, the second part of the book, which is concerned with the application of the sex hormone studies to clinical medicine, could not have been written with conviction or read with appreciation.

After summarizing in the opening chapter the influence of the gonads in the various phases of a woman's life, the author presents in the chapters which follow the evidence which supports these conclusions. This is reviewed, first, as a histologic study of the female generative organs in which the cyclic changes in the uterus and ovaries are correlated, and, second, as a chronologic survey of the physiologic experiments and tests with tissue extracts which were carried out in animals and led to the evolution of the hormone theory and the discovery of the sex hormone in the blood. More recent researches dealing with the distribution of the hormone and its relation to sex growth are exhaustively reviewed. The final chapter of this section deals with the chemistry.

This brilliant survey of the investigative field will be of interest to physiologists, endocrinologists and gynecologists. The latter group may be disappointed that stable solutions of the sex hormone, if available, do not stimulate the ovaries, the author agreeing with Smith and his collaborators that the gonads are activated by the anterior lobe of the pituitary.

The second portion of the book will prove of more general interest. Only the trained laboratory worker can carry out the technique which the author describes for the determination of sex hormone in the blood. The hormone cycle in the normal female has been worked out as a basis for further study. It is admitted that variations from the normal are occasionally found in apparently healthy females, but to one who has done research work these exceptions will not detract from the value of the test but bespeak the accuracy of the reporter. Sex hormone studies have been made in groups of women classified clinically with respect to their degree of femininity, and in patients with gynecologic conditions commonly attributed to hyper- or hypofunction of the ovaries and with certain allied endocrine disorders. This makes fascinating and instructive reading. This test is of importance chiefly as a diagnostic and prognostic procedure but from deductions made we may hope eventually for a potent therapeutic agent. One should not conclude this review without acknowledging the enormous amount of sincere work which this monograph represents. The author does not claim that this work brings the light of noon-day but one who reads this volume will feel that he has stood on higher ground where the sunrise is clearly discernible.

An extensive bibliography is appended.

—Wm. H. Cary.

¹*The Female Sex Hormone*. By Robert T. Frank, A.M., M.D., F.A.C.S. Publisher, Chas. C. Thomas, Springfield, Ill., 1929.

This remarkable amount of statistical data, *Factors in the Sex Life of Twenty-Two Hundred Women*, represents the compilation of their answers to a questionnaire regarding the development of certain phases of their sex life, marriage, masturbation, homosexuality, frequency of intercourse, and the use of contraceptives and periodicity of desire, and their reactions to various other problems as birth control, production of abortion, and prostitution. Seven of the twelve chapters have appeared in the *Journal of Social Hygiene*, *Journal of Mental Hygiene*, and *AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY*. The questionnaire has been answered by an almost equal number of married and unmarried women, college graduates and nongraduates, so that the material collected represents the attitude of an average cross-section of American women. Those who are concerned with the larger problems of sex behavior or education will find much of value, but winnowing the grain from the statistical chaff will be a prodigious task. From the case histories selected, one feels that the earlier sex education is begun and the more fully and frankly it is imparted the fewer will be the aberrancies of adolescent or later life. The answers show a surprising tolerance toward questions of infraction of the moral laws.

—Philip F. Williams.

This small monograph on the *New-Born Infant* is an excellent guide to the care of the normal as well as the abnormal child. The text furnishes in a clear and concise manner all that will usually be necessary for an obstetrician to know until he turns the care of the child over to a pediatrician. The author does not recommend routine circumcision or routine diagnostic roentgenographic studies of the thymus for possible enlargement. The chapter on milk modifications for complementary or supplementary feedings is definite and simple. An excellent help for all engaged in obstetrics.

—Philip F. Williams.

With a wider acceptance of *Spinal Anesthesia* and a larger number of men being trained in its administration a book dealing specifically with the subject should be welcome. Dr. Evans has given here a carefully prepared reevaluation of the subject, giving the indications and the contraindications and weighing the advantages against the disadvantages. There is a critical review of all the drugs used and the preferences of various operators for one or another of them, together with the author's preference for and experience with neocaine. The technique is detailed, this includes chapters on selection of patients, pre- and postoperative care, induction of the nerve-block, and operating room organization, i.e., 'teamwork.' The physiology of low blood pressure production and the pathology accompanying it are gone into in great detail in a chapter on possible complications. The book has an introduction by Babcock, a foreword by Heyd, and a copious bibliography. The book should be of interest and value to the surgical profession.

—Philip F. Williams.

This book, *La Perte de l'Incapacité et les Obturations Tubaires*, is devoted to the subject of intratubal hypodol injections, is based upon the literature and upon the author's own series of 270 cases. Among 44 cases of sterility, details of which are given in the book, hypodol injections revealed that both tubes were normally patent in only 12 per cent (in the conclusions the author says this amounted to 18 per cent). In *Factors in the Sex Life of Twenty-two Hundred Women*. By Katherine Bement Davis. New York, 1929. Harper and Brothers.

The New-Born Infant. By Emerson L. Stone. Philadelphia, 1929. Lea and Febiger.

Spinal Anesthesia. By Charles H. Evans. New York, 1929. Paul B. Hoeber.

La Perte de l'Incapacité et les Obturations Tubaires. By Claude Béclet, Masson and Co. Paris, 1929.

a series of 70 cases of salpingitis only 13 per cent had normally patent tubes. In these cases of sterility and salpingitis, hydrosalpinx was found much more frequently than was detected by bimanual examination. The author believes that salpingography should be used in all cases of sterility for three reasons, namely: it demonstrates the condition of the uterine cavity and tubes, it has some therapeutic value because pregnancy follows in about 10 per cent of all the tests, and if an obstruction is shown the test constitutes the most certain therapeutic guide. Salpingography may also be used after an attack of salpingitis has subsided and following conservative operations on the tubes. Photographs of 70 x-ray plates illustrate the various normal and pathologic conditions found by the author. An extensive bibliography is appended, and it is gratifying to see that the references are not limited to one language.

There is no doubt that salpingography is a valuable aid but 270 cases in the experience of a single individual in a maximum of seven years (the test was discovered by Sicard and Forestier in 1922) indicates that at least some of the tests were probably done needlessly. In spite of the excellent results reported by many individuals, there is definite danger in the use of this test even when the cases are selected with scrupulous care. Furthermore, bimanual examination combined when necessary with the Rubin tubal patency test (which is much safer than lipiodol injections) will give the desired information in the large majority of cases. Salpingography should be reserved for a relatively small number of cases.

—J. P. Greenhill.

In the present edition of this valuable little book, *Einführung in die Gynäkologische Diagnostik*,⁶ the author has made no significant changes. The book is divided into three parts, the first of which is devoted to the anamnesis and general condition of the patient, the second deals with the technic of making an examination and includes the use of special procedures, and the third and largest part of the book is concerned with gynecologic diagnosis. The material is discussed not according to the various gynecologic ailments but according to the different genital organs. External examination is considered first, and then in order the various affections of the vagina, the uterus, the adnexa, the parametrium and finally the pelvic peritoneum (perimetrium). As the title indicates, the book deals almost exclusively with the question of diagnosis. The text is considerably clarified by 159 very clear and instructive illustrations. This book should prove to be of great help to general practitioners and medical students.

—J. P. Greenhill.

This volume, *International Clinics*,⁷ contains a number of valuable articles but the only ones of interest to gynecologists and obstetricians are the following: Katherine H. Coward in a paper on "Recent Research on the Vitamins and Its Clinical Applications," mentions the use of vitamin A in the treatment of puerperal septicemia. The benefits derived from the use of this vitamin in pneumonia led Green and Mellanby to administer this vitamin in cases of puerperal sepsis. Among 24 patients treated without vitamin A, only two recovered, but all five patients who received this vitamin lived. Foods rich in vitamin D and especially cod-liver oil, irradiated olive oil, and radiosterol (irradiated ergosterol), help to produce normal dentine while diets poor in this factor tend to produce hypoplastic dentine (Mellanby). Vitamin E (Evans and Burr) is necessary for the nourishment of the fetus and for the growth of the young rat.

⁶*Einführung in die Gynäkologische Diagnostik*. By Wilhelm Weibel, Ed. 4. Julius Springer, Berlin, 1929.

⁷*International Clinics*. Vol. III. Thirty-ninth Series. J. B. Lippincott and Co. September, 1929.

A second article of interest is by J. H. Burn on "Standardization of Biological Products" in which the author discusses the standardization of neoparsphenamine, insulin, pituitary extract, and ovarian hormone. The only paper devoted exclusively to a gynecologic subject is on "Visualization of the Uterus and Tubal Cavities," by Albert Mathieu. He is very enthusiastic about intravertine lipiodol injection and in a period of three years has used the test in over 200 cases. This is an unusually large series for one individual in such a short period of time, and in some cases at least, perhaps a correct diagnosis could have been made without this test. The author describes his technique in detail and points out the dangers and contraindications of this procedure. Among the indications for this procedure he mentions "the differentiation of acute and chronic salpingitis." I see no necessity to enlist the aid of a lipiodol injection for this purpose and furthermore believe a lipiodol injection in the presence of acute salpingitis may lead to dangerous results. Mathieu admits "there are a sufficient number of reports of accidents, apparently due to the method, to call for the exercise of caution and for the proper selection of cases." Beautiful illustrations enhance the value of this paper. There is no doubt about the value of intravertine lipiodol injections for making a correct diagnosis but the procedure should be limited to very carefully selected cases.

—J. P. Greenhill.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Cesarean Section

A Study of the Cesarean Sections Performed in the Hospitals of New Orleans from 1921 through 1928. *New Orleans M. & S. J.* 79: 815, 1927.

The 291 cases of cesarean section done in 6 New Orleans hospitals during the period 1921 to 1926 have been analyzed by a committee of 5 local physicians. The records show the need of more care and detail throughout and certain flagrant examples are pointed out. Errors and omissions were distressingly frequent. There seemed no excuse for frequent omissions of a statement of the presentation, of the pelvic measurements, etc. The scar of the previous operation was seldom adequately described. Rupture of the scar of previous section occurred in 8 per cent of this series. An instance is given in which rupture of a former cesarean scar occurred following the third dose of pituitary extract. The relative youth of the patients and the very high percentage of primiparae calls for comment in view of the fact that a first cesarean introduces at least the possibility of another abdominal delivery in a subsequent pregnancy.

The actual incidence of cesarean section in hospital practice for six years was 1.8 per cent and 0.000484 per cent for the city in general. The highest incidence in a single hospital was 5.4 per cent, the lowest 1.2 per cent. Nearly 20 per cent of the patients were not at term and the stage of gestation ranged as low as five months. In view of the fact that the death rate among premature infants in this series is over 36 per cent, the mother's safety should be the paramount consideration in the treatment of any complication of pregnancy before term. Cesarean section in placenta previa should be performed only in the interest of the mother as the fetal death rate is 40 per cent, nearly half of which is due to prematurity. The maternal death rate was 10 per cent.

Over one sixth had previously been delivered by cesarean section and many obviously had been delivered from below in spite of clearly indicated section. Three-quarters of the cases were done according to the classical technic. Only 4.2 per cent had the Porro operation. This seems surprisingly small considering the comparatively large number of grossly and potentially infected cases. Eleven per cent were sterilized. This is surprisingly low in view of the large number of repeated cesarean operations. The fact that both the maternal and fetal mortalities after cesarean section have shown a gratifying decrease in the last three years may be attributed to a wiser selection of cases, the occasional employment of the Porro operation in grossly infected cases, and the routine employment on certain services of the low cervical operation (laparotrachelotomy) in potentially infected cases. The Porro operation should be employed in grossly infected cases when vaginal delivery is impossible, even with a dead baby. Low cervical cesarean section has also furnished excellent results in 30 potentially infected cases.

The indication in one-third of the cases was deformity of the bony pelvis. Relapsing was responsible for one-sixth but appears rarely after 1922. The maternal death rate of 4.5 per cent in these sections should be sufficient to conclusively exclude such treatment. Many of the indications seemed insufficient to warrant laparotomy. Malposition of the fetus, per se, should not furnish an indication. Nearly two-thirds of the patients had a febrile convalescence which in itself would complete the indications for section in subsequent pregnancy. In 17 cases following the classical operation, serious dilatation of the stomach occurred. The total maternal mortality was 16.1 per cent but 16 of the 47 deaths were listed as due to eclampsia. It is quite apparent that the death rate in cesarean section increases in direct proportion to the length of time the membranes have been ruptured, the number of vaginal examinations, and the attempts at previous delivery. In spite of a high gross fetal and maternal mortality, there has been a gratifying decrease in the later years. Also the incidence of cesarean section has definitely decreased from its peak in 1921.

GOODRICH C. SCHAVFELER.

Ilikevich, Seliky and Levy: Cesarean Section in Moscow During Seven Years (1921-1927). J. Akush. i Zhensk. bolez. 40: 166, 1929.

In a period of six years 743 cesarean sections were performed in a series of 309,468 deliveries. In Moscow the percentage of cesareans has rapidly increased. While in 1921 for 36,000 deliveries only 10 cesarean sections were done. In 1927, sections rose to 233 for 53,000 deliveries (4.4 per 1000). This the author believes is due to the fact that inexperienced physicians now are performing many unnecessary operations and that cesareans are now done in all maternity homes and not as before only in clinics by head physicians and their assistants.

The main indications for operations were: (1) pelvic anomalies (422 cases); (2) placenta previa (127 cases); (3) eclampsia (106); and (4) unusual indications (38).

Most often the methods of Sanger, Wittsch, Miller and Polano were employed, more recently the method of Kroening-Opitz. Of 71 transperitoneal-retrovesical operations 31 had a febrile course but no mortality to be charged to the operation. Of two deaths one was due to thrombosis of the pulmonary artery and the other caused by an eclampsia in a patient with a goiter and syphilis of the brain. The high classical cesarean sections had a 4.4 per cent mortality from sepsis and the low cesareans of 3.3 per cent.

In regard to general morbidity the most unfavorable results were obtained with the low cesarean which was 26.6 per cent. In this respect the retrovesical operation ranks next with 21.2 per cent and the classical cesarean with only 18.1 per cent postoperative infection.

ALEXANDER G. GABRIELIANZ.

Tombs, Percy W.: The Abuse of Cesarean Section. Illinois M. J. 54: 278, 1928.

During the past quarter century it has been learned at a high cost how really dangerous cesarean section is in the second stage of labor, after repeated vaginal examinations and attempts at manual delivery. Patients of the well-to-do class often insist on it and the physician yields. In the small hospitals, the surgeons predominate and more cesareans are done. Williams went on record as saying, "that insurmountable disproportion between the size of the head and the pelvis, and obstruction by a tumor are practically the only indications concerning which there can be no dispute." A breech presentation occurring in an elderly primipara with a rigid cervix and a normal pelvis may be an indication.

In Massachusetts in 1922, 1166 cesarean sections were done, 1 to every 78 births. Of the mothers, 102 died, the mortality being 8.8 per cent.

Placenta previa is most generally an indication for Voorhees bag induction, the exception being severe bleeding with no dilatation in a previa centralis, when a cesarean might be fully justified.

HIEMSTRA.

Martin E., and Spieckhoff: The "New Way" in Obstetrics as Suggested by M. Hirsch. *Monatsehr. f. Geburtsh. u. Gynäk.* 81: 154, 1929.

As an answer to M. Hirsch's plea for more cesarean sections and fewer vaginal deliveries, the authors analyzed their statistics from 1919 to 1928. Among 405 abdominal cesarean sections there was a maternal mortality of 4.4 per cent (corrected to 2.4 per cent) and a fetal mortality of 3.7 per cent (corrected to 0.7 per cent). For 312 vaginal cesarean sections the maternal mortality was 4.8 per cent (corrected to 1.2 per cent) and the fetal mortality was 15 per cent (corrected to 9.5 per cent). In a series of 114 versions and extractions, 11.4 per cent of the mothers died (corrected to 3.5 per cent) and 23.7 per cent of the children died (corrected to 10 per cent). The maternal mortality for 630 forceps operations was 0.7 per cent (corrected to 0) and the fetal death rate was 8.2 per cent (corrected to 1.3 per cent). For the 58 perforations the maternal mortality was 6.8 per cent (corrected to 0). Hence the maternal mortality for the 1114 vaginal deliveries was 3.5 per cent (corrected to 0.7 per cent) and the fetal mortality was 16.5 per cent (corrected to 4.6 per cent). The authors conclude that abdominal cesarean section exacts a greater toll of mothers' lives than delivery through the vagina.

J. P. GREENHILL.

Fitz-Patrick, Gilbert: An Ethical Consideration of the Indication for Cesarean Section. *Illinois M. J.* 52: 458, 1927.

The indications for cesarean section have been so widened that the operation is being done for trivial complications of pregnancy and the operation is being abused as an obstetric procedure. Although the operation is easier than almost any other important operative procedure and almost certainly insures a living child, we must as well consider the ultimate effects of the operation on the mother and the rights of both parents and of the State.

The mortality rate, especially in hands of physicians not trained in obstetric procedure is high. It is an injustice to the parents and to the State to perform any unnecessary cesarean section. The fact of the great extension of section deliveries is an indictment of the inadequacy of obstetric knowledge and an indication of obstetric failure.

GENE M. KASPER.

Paine, A. K.: The Ethics of Cesarean Section. *New England J. Med.* 201: 445, 1929.

Cesarean section is recognized as having in itself the highest maternal mortality of any delivery operation. In Massachusetts, in 1928, 456 maternal deaths were reported; in 56 of them a cesarean section had been performed, one in eight. The marked variations in recent literature reported in different localities, hospitals, in different services, etc., indicate that something other than scientific obstetrics is involved in the frequent resort to this operation.

The obstetrician faces a duty, a moral obligation to rise superior to expediency in his conduct of a delivery. The outcome of a slow and difficult labor will be

readily accepted by the average family if it understands that the alternative cesarean section carries with it a definite one chance in ten of a dead mother. It is questionable if the obstetrician has not a moral obligation to impart this information in every contemplated cesarean section.

EHRENFEST.

Gauss: Pro and Contra a Wider Indication for Cesarean Section. Deutsche med. Wochenschr. 55: 817, 1929.

A statistical study is offered based on the literature of the last fifteen years and the author's own experience. (University Hospital Wuerzburg.) The advantage of the cesarean section is admitted for cases of anomalous placenta, narrow pelvis and eclampsia, in which it will reduce the mortality of the child. The operative procedure, however, introduces new dangers for the mother. There is no statistical proof that any one of the three methods, cervical, extraperitoneal, or transperitoneal, was followed by a lower mortality. The only improvement in this respect could be expected by making the indication for operation at an earlier time, which means at a time when a sufficiently founded indication often really cannot be made. The inevitable consequence of such haste in finding justification for operation would be a most undesirable increase of obstetric operations, often unnecessary and harmful to the patient, the family, and the nation. To evaluate fully all the sequelae of cesarean section one must consider also the morbidity following the operation: bronchopneumonia, thrombosis, embolism, wound infection, peritonitis, ileus, endometritoma, bladder stone, etc. A further drawback is the diminished safety for subsequent deliveries or the voluntary or necessary sterility subsequent to the section. The author strongly advocates the continuation of present conservative indications for obstetric operations.

C. E. GREENFIELD.

Zangemeister W.: Early Cesarean Section. Monatschr. f. Geburtsh. u. Gynaek. 77: 100, 1927.

In spite of all aseptic precautions, deaths from infection occur occasionally after cesarean section. A study of these cases reveals that the danger in such cases increases not only after rupture of the membranes but also with the increase in the duration of labor, even when no internal examinations are made. Because of this, and the good results obtained by performing cesarean section during pregnancy in cases of eclampsia and placenta previa, Zangemeister has for years performed cesarean sections early, that is at the beginning of labor and in some instances at the end of pregnancy. His experience has taught him that the danger of infection is much less and that the fear of lochial retention and hemorrhage from the placental site are unfounded. Zangemeister has devised an instrument for dilating the cervical canal in the cases where the cervix is closed, because he believes a free lochial flow is a preventive of infection.

J. P. GREENHILL.

German, William J.: Endometrial Adenomas in Abdominal Scar Following Cesarean Section. Surg. Gynec. Obst. 47: 710, 1928.

Endometrial adenomas in the abdominal scar, following opening of the pregnant uterus, have been reported in 12 cases. These cases are here reviewed and 2 new cases are added.

The most frequent symptom is pain in the scar during the menstrual periods. Local excision is sufficient for removal of the tumor.

The implantation theory would seem to give the best explanation of the origin of this group of endometrial adenomas.

The occurrence following cesarean section would suggest the preferable use of the low type of uterine incision as the lining in that region is chiefly cervical mucosa.

WM. C. HENSKE.

Bach: Histologic Study of the Uterine Wall After Several Cesareans. *Ztschr. f. Geburtsh. u. Gynäk.* 93: 435, 1928.

The uterine wound after cesarean section will heal either with a complete regeneration of the muscle fibers, with the formation of a scar or with transplantation of pieces of endometrium into the wound. In the author's case the uterus was removed at the third cesarean. Sections taken of the areas where the former incisions were made showed regeneration of the muscle in spite of her having had fever after the second operation. He thinks the temperature was due to thrombosis in pelvic veins.

FRANK A. PEMBERTON.

Hellmuth: Spontaneous Rupture of Uterine Scar After Intraperitoneal Cervical Cesarean Section. Is Extension of the Indications for Abdominal Delivery Advisable? *München. med. Wehnschr.* 75: 1626, 1928.

Hellmuth believes that after cervical cesarean section there is considerable danger of later rupture of the scar. Including the recent report of Vogt and Willkomm, there are in the literature 16 cases of spontaneous rupture of the lower uterine segment scar in subsequent pregnancies and labors. Three additional cases are reported. In the first case, two previous cervical sections had been done because of moderately contracted pelvis. There had been a slight rise in temperature during the first postoperative week after the second section. At term in the third pregnancy, after sixteen hours of weak pains without progress, another section was done. Except for the peritoneum, a complete rupture of the previous scar was found. In the second case, rupture occurred eight days before term in a third pregnancy, the first having ended in spontaneous delivery, and the second terminated by low section for placenta previa. The placenta was extruded through the wound. There was a slight rise in temperature for two days after the first section. In the third case, the first section was done because of a moderately contracted pelvis. There was slight temperature during the first postoperative week. At term in a second pregnancy, the scar ruptured after one hour of severe pains. The placenta presented at the site of rupture.

The author concludes that every patient who has had an abdominal delivery, whether classical or cervical, is a candidate for rupture of the uterus. This is especially so if the convalescence has been marked by any rise of temperature. He emphasizes the possibility that the placenta may be implanted over the site of incision and that if this occurs, rupture is very likely. It is to be suspected if hemorrhage occurs before term in such cases. A first cesarean section should only be done for very pressing indications, even though the choice of other measures may be at the cost of the child's life. In placenta previa, cesarean section does not improve the prognosis of the mother as much as it does that of the child. In cases of moderately contracted pelvis, later children may often be spontaneously delivered, even though the first was lost. In deciding to do a cesarean section one should consider the danger of rupture of the scar in subsequent labors, the dangers of regularly repeated section, and the possibility of incisional hernia, peritoneal adhesions, secondary sterility, etc. The author agrees with Peham that "even

the best operator, no matter how wise he is or how good his technique, will find it impossible uniformly to obtain scars which will resist uterine contractions under all conditions."

A. SHULMAN.

Wilson: Three Cases of Rupture of the Uterus at the Site of a Previous Cesarean Section. *Lancet* 213: 598, 1927.

Two of the three cases of ruptured uteri reported by the author occurred at the commencement of labor. There was no definite evidence of the onset of labor in the third case. The writer is unable to explain the ruptures as the previous cesarean sections were done by an experienced surgeon and the postoperative courses of all three were free from any evidence of sepsis. He found that there was evidence of weakness in the scars of two cases when the placenta was found anteriorly, whereas the scar was found in the one case when the placenta was posteriorly. The author does not subscribe to the dictum "once a cesarean, always a cesarean," and concludes if labor starts without rupture of the uterus it can be expected to terminate likewise.

II. C. HESSELTINE.

Küstner, H.: Uterine Rupture After Previous Cesarean Section. *Monatsschr. f. Geburtsh. u. Gynäk.* 79: 286, 1928.

Spontaneous rupture of the uterus has become more frequent according to reports in the literature. In most instances the history will reveal causes for either described weakness of the uterine wall. The danger of rupture after a previous injury is increased by two factors, one of which is the location of the damage. Injury to the fundus is much more dangerous than damage to the isthmus and cervix. For this reason the cervical cesarean section should be the usual type of cesarean. When ruptures occur after cesarean section or other injury to the uterine wall, they are not usually in the scar but just alongside of the scar. This is due to the fact that the scar tissue is strong but the tissue adjacent to the scar is degenerated; it is the region the nutrition of which is disturbed by the sutures when the uterine wound is closed.

Another important factor in spontaneous rupture is the interval of time which elapses between the injury to the uterus and the new pregnancy. This is more important even than the location of the injury. It requires a long time for wounds to heal and as long as the skin wound is still reddish, the wounds are not completely consolidated. The author reports a case of rupture of the uterus in which he believes the new pregnancy began before the cesarean section scar was completely consolidated. The rupture occurred between the scar and the normal muscle tissue. The author believes that at least one year should elapse after cesarean section before a new conception is to take place.

J. P. GREENHILL.

Heilmuth: Sequelae of Cesarean Section: Subsequent Fertility. *München. Med. Wchschr.* 76: 737, 1929.

Heilmuth has followed up 112 patients who had had 133 cesarean sections between 1907 and 1923, to determine the incidence of various sequelae, and the course of later pregnancies and labors. Of those whose first section was for contracted pelvis, 80 per cent were delivered a second time by section. All of those who had had two sections were delivered in the same manner in later pregnancies.

It was found that 30 per cent of patients delivered by section are sterile thereafter; in patients who had had two sections, 64 per cent remain sterile. This sterility is independent of the type of operation. The chief cause is the practice of contraception due to fear of subsequent operative deliveries.

Other sequelae were rupture of the uterus in two cases and hernia in the abdominal scar in three cases. A large number of patients had subjective symptoms, which they attributed to the operation, such as lessened capacity for work, pain in the scar, backache, constipation, menstrual disturbances, etc. Hellmuth draws the conclusion from his studies that the indications for cesarean section should be very strictly drawn.

A. SHULMAN.

Wille, F. C.: *The Course of Labor After Cesarean Section.* *Monatsh. f. Geburtsh. u. Gynäk.* 73: 219, 1926.

Among 28,917 labor cases at the Charité there were 357 abdominal cesarean sections (1.2 per cent). The primary mortality was 1.4 per cent. A second cesarean section was performed 49 times, a third operation 19 times and a fourth operation once. In many cases where the indication for the cesarean section was not a contracted pelvis, the patients were given a test of labor in subsequent labors. Nineteen patients had spontaneous deliveries subsequent to a cesarean section. In addition 16 were delivered by operative procedures per vaginam. In contrast to these 35 cases there were 2 spontaneous and 2 violent ruptures of the uterus. The incidence of rupture of the uterus was 4 per cent. The cause of rupture is not to be found in the new pregnancy but in the complications of the previous operation. If a uterus is to hold its integrity in a subsequent labor, a cesarean section must be performed aseptically and with perfect technic. The wound edges must be smooth and not torn during extraction of the child. The muscular wall must be sewn in two layers without including the mucosa. Catgut is the material to be used. When rupture occurs the best operation is abdominal total extirpation. One of the 4 patients with rupture in this series died.

J. P. GREENHILL.

Häggström, P.: *Ileus After Cesarean Section.* *Acta Obst. et Gynec., Scandinavica* 4: 328, 1926.

In addition to an account of five cases of his own of intestinal obstruction after cesarean section, Häggström collected 30 similar cases from the literature. After comparing the incidence of intestinal obstruction following cesarean section, out of 731 cesareans there were 13 cases of obstruction, with similar complications after other cases of laparotomy, the author came to the conclusion that the obstructive cases occur to an extent of about 1 per cent. The commonest cause and the most important one of this complication is the formation of adhesions between the uterus and other organs in the abdominal cavity.

Among prophylactic measures the author emphasizes the importance of good technic, strict asepsis and efficient control of bleeding. It is further important that the uterus be opened retrovesically in the lower uterine segment, and not in the fundus.

The treatment of ileus should be undertaken as early as possible. High intestinal lavage should first be energetically tried and if no satisfactory result follows, relaparotomy should be done. Only in exceptional cases should one be content with performing an enterostomy.

The prognosis in the complicated cases is bad, there being a mortality of 30 to 50 per cent; but this could probably be reduced by earlier operation.

J. P. GREENHILL.

News Item

Central Association of Obstetricians and Gynecologists

This organization was created in St. Louis on October 20, 1929. Its activities and membership will include a territory which embraces some twenty states bordering upon the Mississippi and Missouri Rivers and the Gulf of Mexico. About 175 obstetricians and gynecologists compose the charter membership.

In founding this society, the committee on organization had in mind the group of men specializing in obstetrics and gynecology who are not affiliated with either of the two national societies, and so are denied the fellowship and inspiration which such organizations afford. That there are many such is evidenced by the enthusiastic response to the call of the committee on organization.

A two-day program, consisting of clinics, laboratory demonstrations and papers, was presented by the St. Louis group and others. The St. Louis Maternity Hospital and its laboratories provided a wealth of material for a two-day session.

Conditions for membership are less exacting than are in force in the American Gynecological Society and the American Association of Obstetricians and Gynecologists. A minimum of five years after graduation is required, the applicant must present evidence of having had a substantial training in obstetrics and gynecology, and he must confine his practice largely, though not exclusively, to the specialty. Having the interest of the young man in mind, it did not seem fair to demand that he confine himself exclusively to the practice of obstetrics and gynecology. It is hoped that the society and its affiliations will give the needed inspiration that will finally develop such men into specialists.

Every effort will be made to enlist the interest of the general practitioner in the meetings of the society. Invitations will be extended to the general profession and the courtesy of the floor will be extended to them. By so doing, it is hoped that the society may extend its influences for better obstetrics to the profession at large. The officers for the ensuing year are: Palmer Findley, Omaha, President; Fred J. Tauszig, St. Louis, President-Elect; E. L. King, New Orleans, Vice-President; E. D. Plass, Iowa City, Secretary and Treasurer. Additional members of the Council are: Carl Henry Davis, Milwaukee; Fred H. Falls, Chicago; P. W. Toombs, Memphis.

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Original Communications

RADIATION AND SURGICAL TREATMENT OF CARCINOMA OF THE BODY OF THE UTERUS

RESULTS IN ONE HUNDRED CASES FROM THE MEMORIAL HOSPITAL,
NEW YORK

BY WILLIAM P. HEALY, M.D., AND MAX CUTLER, M.D., NEW YORK, N. Y.

IN THE analysis of this group of cases attention has been directed especially to two problems, first, the relationship between histologic structure and prognosis and, second, the comparative value of radiation and operation in the treatment of these tumors. It is the purpose of this investigation, therefore, to analyze the various factors which influence the ultimate result, and to endeavor to determine the therapeutic method of choice in the treatment of each histologic type of fundus carcinoma.

The tendency to regard carcinoma of the body of the uterus as a single clinical and pathologic entity has been criticized by various investigators, a criticism which appears to be justified. Thus the existence of a group of cases in which the lesion is superficial and often cured by curettage, emphasizes the importance of recognizing this histologic group. The prompt recurrence of the very cellular types after hysterectomy, even in the early stage of the disease, is also evidence of the prognostic importance of this histologic type. The advent of radiation as a therapeutic measure in uterine cancer has added special significance to histologic structure in relation to radiosensitivity. Thus, in carcinoma of the cervix it has been shown¹ that the anaplastic

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

type (Grade III), which is accompanied by a very unfavorable prognosis under surgical treatment, is especially amenable to radiation therapy. The recognition of a small but definite group of highly undifferentiated tumors in the body of the uterus is, therefore, of considerable importance in order to compare their response to surgery and radiation respectively.

In 1923, Mahler in a study of 186 cases of fundus carcinoma treated at The Mayo Clinic, concluded that a definite relationship existed between histologic structure and end-result. He noted that in Grade I which was the most differentiated type no deaths occurred, whereas in Grade IV showing complete loss of differentiation every patient died. Lindsays in 1927, in an analysis of cases from the Memorial Hospital and the New York Hospital confirmed these results. He stated that adenoma malignum is a much less fatal disease than adenocarcinoma, and concluded that embryonal carcinoma (diffuse carcinoma, Grade IV) yields better results by radiation than by operation. Norris and Vogt in 1924 reported 115 cases of carcinoma of the fundus of the uterus observed at the University of Pennsylvania Hospital. They concluded that the treatment of choice is panhysterectomy combined in selected cases with radiation. Stays in 1925 reported 269 cases operated upon at The Mayo Clinic between 1907 and 1921 and 41 cases treated by radium between 1916 and 1921. Of the 269 cases operated upon there was a hospital mortality of 14. Of the total number, 215 were traced, of which 108 or 50.23 per cent were living for more than four years. Of the 41 cases treated with radium, 10 or 31.25 per cent lived more than three years. The author concludes that early cases of carcinoma of the body of the uterus are better treated by surgery than radium. It should be noted that the average amount of radium used was only 3,000 mg. hr. In 1925, Davis reported fifty cases of fundus carcinoma from Massachusetts General Hospital. There were four operative deaths among 42 patients treated by hysterectomy. Nineteen out of 42 patients or 45 per cent were living at the end of three years. In 1925, Healy⁷ reported 27 cases of fundus carcinoma treated in the Memorial Hospital by radium alone between 1918 and 1921. Of these, 12 or 44 per cent were living four or more years after treatment. The author concluded that the evidence was not yet sufficient to justify the treatment of operable fundus carcinoma by irradiation alone. Regaud states that adenocarcinoma of the body of the uterus is essentially resistant to radiation. He advises radiation therapy in advanced cases, but recommends operation in the operable group.

That the radiation treatment of fundus carcinoma has yielded more encouraging results in some clinics is indicated by the following reports: In 1926, Philipp and Gomich⁸ reported 40 cases of carcinoma of the body of the uterus treated at the Gynecologic Clinic of the University of Berlin between 1913 and 1919. In all these, radium alone was used. Forty-five per cent of the whole group and 52.9 per cent of the operable cases were well at the end of five years. Heyman's⁹ statistics from the Radiumhemmet, Stockholm, show 46 cases of fundus carcinoma treated with radium. Of these, 25 were operable and 21 inoperable. Of the entire 46 patients, 20 or 43.5 per cent were living and free from symptoms after five years. Of the 25 operable cases, 15 or 60 per cent were living and well after five years. He states that a review of the statistics of other authors treating fundus carcinoma with radium shows that their results have not been so good as those at the Radiumhemmet, the percentage of five-year cures reported by others in all cases varies from 27.3 to 36.2 per cent and in operable cases from 31 to 55.6 per cent. The author concludes that all inoperable cases as well as those in which operation is technically difficult should be treated by irradiation. He further states that no definite con-

clusions can be reached as yet in regard to operable cases, but that the experience of the Radiumhemmet indicates that even in these cases radiation may give at least as good results as operation.

Carcinoma of the corpus uteri occurs in several distinct histologic varieties. Although the pathologic classifications of various authors show some differences, their essential similarity is noteworthy. Kaufmann¹¹ divides them into adenoma malignum, adenocarcinoma, papillary adenocarcinoma, solid adenocarcinoma, and adenocarcinoma with squamous metaplasia. Ewing¹² follows a very similar classification, recognizing in addition adenomyocarcinoma and papillary adenoma malignum as separate histologic varieties. Cullen¹³ does not divide carcinoma of the uterus into definite groups. He is of the opinion that those tumors in which the papillary arrangement is most marked take their origin from the surface epithelium, whereas



Fig. 1.—Superficial, papillary adenoma malignum. Grade I.

those in which the gland-like arrangement predominates start first in the glands. Mahle's classification of corpus carcinoma is based upon MacCarty's¹⁴ standard of cellular differentiation. A grouping of cases according to these factors is comparable to Broder's¹⁵ classification of squamous cell epithelioma into Grades I, II, III, and IV. It should be noted also that the four grades of Mahle correspond closely to the four divisions in Ewing's classification, namely: superficial adenoma malignum, malignant adenoma, adenocarcinoma, and diffuse carcinoma.

In the present study the same principles of cellular differentiation have been employed in the pathologic classification as were followed by Mahle. A division of our cases based upon these factors results in a classification which is similar to those of Kaufman and Ewing. It is convenient to separate from the main group two histologic varieties

which are rare but distinct entities, namely, adenomyocarcinoma and adenocarcinoma. As there were no cases of the former in this material, this histologic variety will not be discussed here.

Adenocarcinoma.—Shows a combination of glandular and epidermoid epithelium. The squamous cells may predominate over the glandular structure, and there may be definite pearl formation. Kaufman describes a combination of superficial acanthoma with adenocarcinoma, and believes that one has to deal with a double origin from superficial lining cells and from gland cells.



Fig. 2.—Adenoma malignum, Grade II.

Grade I. Papillary Adenoma Malignum.—This is a characteristic form in which the growth is superficial and entirely papillary. The papillae are low, the cells are not very atypical and there is no infiltration. Some cases are extremely difficult to distinguish from adenomatoid endometritis. It is in this histologic type that cures following curettage have been observed.

Grade II. Adenoma Malignum.—Comprises those cases in which the uterine glands are markedly enlarged and elongated. They are often thrown into folds and convolutions to form papillae. The cells are cuboidal or cylindrical and are arranged in compact layers about the gland lumen. The nuclei are very hyperchromatic, giving to the

stained section a dark appearance. Mitoses are often abundant. The entire tumor appears to be composed of giant glands encroaching upon the interglandular connective tissue. The stroma is thus scant and adjacent glands come in direct contact. The polarity of the tissues is everywhere maintained. As Lindsay has emphasized, if at any point the cells show a tendency to form solid masses and infiltrate the stroma, the tumor should be classed as adenocarcinoma.

Grade III. Adenocarcinoma.—Adenocarcinoma includes all cases in which the tumor forms solid masses of cells which grow in cords and

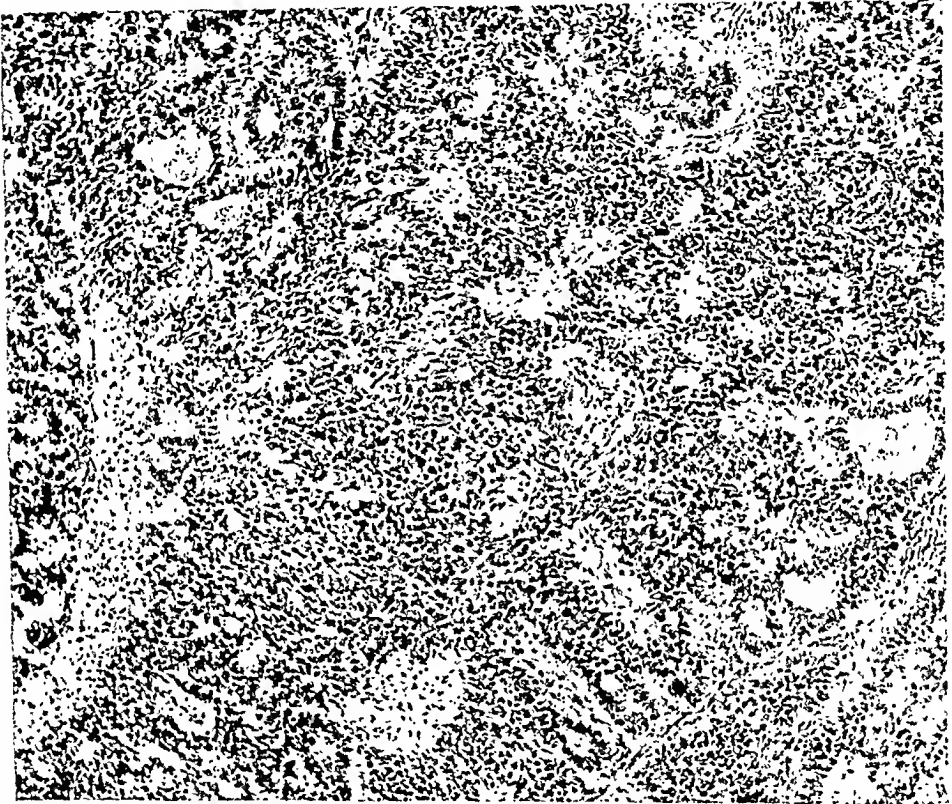


Fig. 3.—Adenocarcinoma. Grade III.

columns. There is definite loss of polarity with infiltration of the stroma. Signs of anaplasia are more marked than in adenoma malignum. The cells are more atypical. Not infrequently portions of the tumor show adenoma malignum and other parts adenocarcinoma. These are classed as adenocarcinoma. Although the growth is more atypical than in adenoma malignum, the glandular arrangement is still maintained.

Grade IV. Diffuse (Embryonal. Anaplastic) Carcinoma.—This group is characterized by a complete loss of polarity. The glandular arrangement is entirely lost. The growth is diffuse and is composed of small round and polyhedral cells, closely packed, growing in sheets

and cords. The nuclei are small and hyperchromatic and the cytoplasm is scanty. There are marked signs of anaplasia. There is complete loss of differentiation. Mitoses are very abundant. The histologic structure often closely resembles anaplastic epidermoid carcinoma of the cervix from which it may be difficult to distinguish microscopically.

Age Incidence.—The following is the distribution of 87 cases of fundus carcinoma according to age:

YEARS	CASES
Under 20	1
20 to 30	0
30 to 40	3
40 to 50	16
50 to 60	40
60 to 70	20
70 to 80	7

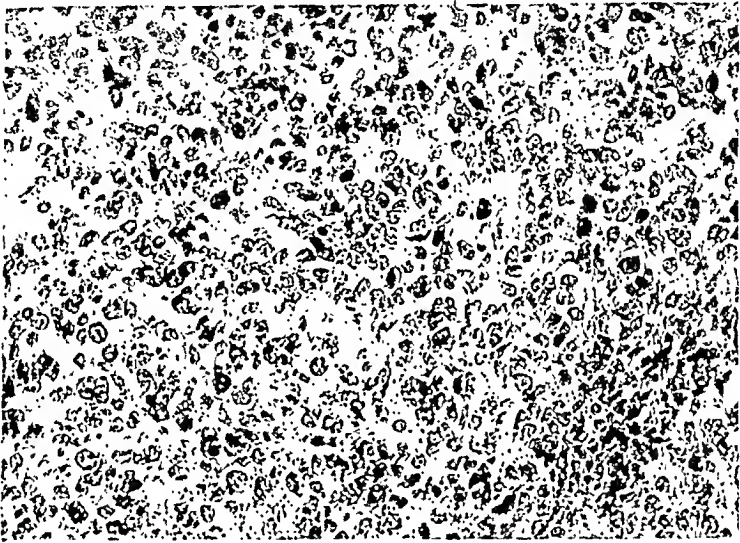


Fig. 4.—Showing diffuse, anaplastic carcinoma, Grade IV. (For gross specimen see Fig. 3.)

The average age of the patients on admission was fifty-six years. Seventy-six out of 87 occurred between the ages of forty and seventy. The commonest age incidence was between fifty and sixty, 40 cases or 46 per cent occurring during this period of life.

Effect of Gestation.—Data concerning gestations was noted in 85 cases. Twenty-one patients or 25 per cent were nulliparae. Norris and Vogt report an incidence of 26 per cent and Lindsay 36 per cent occurring in single women.

Symptoms.—The average duration of symptoms in the entire series from the time of onset to time of admission was 12.75 months. The duration of symptoms in each histologic group is shown in the following list.

Grade I	6 months
Grade II	19 months
Grade III	13 months
Grade IV	13 months

The short duration in superficial adenoma malignum is compatible with the clinical course and pathologic findings in this group. They undoubtedly represent early lesions of relatively short duration. The significance of the duration of symptoms in the other groups will be discussed more fully below. Vaginal bleeding is the outstanding clinical symptom, pain is infrequent and is a late manifestation of the disease. Constitutional symptoms also occur late in the course of the disease.

PAPILLARY ADENOMA MALIGNUM, GRADE I

Of fourteen patients (Table I) with lesions belonging to this histologic group, seven were treated by radiation alone and seven by combined radiation and hysterectomy. With the exception of one post-operative death, all are well, four to nine years after treatment. In two instances hysterectomy was performed for pyometra following primary intrauterine radiation. In several cases the uterus, removed after curettage and radiation, failed to show any evidence of tumor, a finding which has been observed and recorded by other writers.

The evidence presented by these results confirms the already recognized fact that this phase of the disease is of favorable prognosis. It is important to emphasize, however, that in spite of its superficial character the tumor is resistant to radiation and requires an adequate initial treatment to control it. The favorable results obtained in these cases by either method of treatment establishes the importance of recognizing this special group and separating it from the main group of uterine cancer. It appears from the data presented in Table I that radiation is as certain and reliable a method of treatment in this group of cases as is hysterectomy and because of its greater safety is to be regarded as the method of choice. These results demonstrate that hysterectomy may be reserved especially for those cases which are associated with myomas or complicated by pyometra.

ADENOMA MALIGNUM, GRADE II

Cases Treated by Radiation Alone.—Of 17 patients with lesions belonging to this group treated by radiation alone (Table II), 8 are alive and 9 died. Three patients (Cases 4, 43, and 66, Table II) with advanced disease, are well four to six years each. Case 4 is of special interest as the tumor was determined to be inoperable by exploratory operation. One pelvic node was removed and showed invasion by carcinoma histologically. Radium emanation was inserted into the pelvic nodes by means of bare tubes and an intrauterine radium application

TABLE I. SUPERFICIAL ADENOMA MALIGNUM GRADE I

CASE	AGE	CELL-DREN	DURATION OF SYMPTOMS	INTRAUTERINE TANDEN (MC.-HR.)	VAGINAL BOMB (MC.-HR.)	ENTERNAL RADIUM (MC.-HR.)	EXTERNAL RADIATION X-RAYS	INTERNAL RADIATION (MC.-HR.)	OPERATION	ALIVE	DEAD	REMARKS
RADIATION ALONE												
17	38		2 wk.	690* (11/18/19) 572* (12/1/19) 1200† (1/20/20)	2100 (12/18/19)					9 yr.		Uterus somewhat enlarged. Freely movable.
20	33	1	3 yr.	3180 (6/28/24) 3000 (8/20/24) 2500 (2/21/25)			I H.V.P.C. (Dec., 1924)			4 yr.		Duration of symptoms 3 yr.
41	38	3	2 mo.	980† (4/23/18)	1000 (5/20/19)	18000 Block (5/2/18)				10½ yr.		Uterus moderately enlarged.
44	53	2	6 mo.	2706 (5/20/24)						4½ yr.		Uterus small. Has remained well after a single intraterine radium treatment.
47	64	3	3 mo.	1300 (6/2/25) 2070 (7/7/25)						3 yr. 9 mo.		Uterus small. Patient is well after two intraterine radium applications.
103	53		3 mo.	2340 (6/6/22)	3000 6/26/22)	16000 Pack (6/16/22)				6 yr.		Myoma and adenoma malignum, treated with tandem and bomb.
105	71	0	1½ yr.	1206 (4/24/23) 2525 (5/29/23)			I L.V.P.C. (5/28/23)			5½ yr.		Uterine bleeding for 18 mo. Well after two intraterine radium applications.

*Filtration, 1 mm. A.F.
†Filtration, 1 mm. P.₂

TABLE I—CONT'D

CASE	AGE	CHILDREN	DURATION OF SYMPTOMS	INTRAUETERINE TANDEM (MG.-HR.)	VAGINAL BOMB (MG.-HR.)	EXTERNAL RADIATION RADIUM (MG.-HR.)	EXTERNAL RADIATION X-RAYS	INTERSTITIAL RADIATION (MG.-HR.)	OPERATION	ALIVE	DEAD	REMARKS
RADIATION AND HYSTERECTOMY												
39	59	1	1 yr.	1782 (9/16/20)				8 bare tubes into parametria	Complete hysterectomy (10/8/20)	8 yr.		Curettings showed superficial papillary adenoma in situ. Uterus removed, later showed no evidence of tumor.
55	55	7	5 wk.	3000 (10/ 3/21)	9000 Block (2/22/21)				Complete hysterectomy (9/22/22)	8 yr.		Uterus showed a small circumscribed superficial lesion.
61	47	0	3 yr.				I L.V.P.C. (2/4/24)		Complete hysterectomy (1/18/24)	5 yr.		Hysterectomy for pyometra. Myosarcoma and adenoma malignum.
64	58	0	18 mo.	3008 (2/19/24)			I L.V.P.C. (9/10/25)		Complete hysterectomy (3/9/26)	5 yr.		Hysterectomy for pyometra two years after radiation.
77	51		6 mo.	3009 (12/20/19) 3000 (2/18/20)					Complete hysterectomy (12/4/21)	5 yr.		Uterus removed at operation for intestinal obstruction.
80	72	0	3 yr.	1936 (3/ 1/27)					Complete hysterectomy (3/8/27)		2 days postoperative	Postoperative death. Myoma and adenoma malignum.
59	55	7	4 mo.	3000 (9/12/22)					Complete hysterectomy (12/5/22)	3 yr.		

TABLE II. ADENOMA MALIGNUM TREATED BY RADIATION ALONE

CASE	AGE	CHIL- DREN	DURA- TION OF SYM- TOMS	INTRAVETERINE TANDEM (MC.-HR.)	VAGINAL BOLE (MC.-HR.)	EXTERNAL RADIUM (MC.-HR.)	EXTERNAL RADIATION X-RAYS	INTER- STITIAL RADIATION (MC.-HR.)	ALIVE	DEAD	REMARKS
2	55	0	1 yr.	1940 (4/26/21) 1428 (5/17/21)	.				7 yr.		Irregular bleeding for seven years.
4	56	0	1 yr.	3350 (11/14/22)				1500 B.T. (12/19/22)	6 yr.		Advanced lesion, inoperable, bare tubes inserted into uterus and pelvic nodes.
5	69	2	2 yr.	1215 (11/15/20)				4923 G.T. (2/8/27) (3/5/28)	7 yr. 6 mo. Recur- red		Recurrence three years after initial treatment, free of disease one year.
27	54	2	2 yr.	2500 (9/6/21)	3000 (9/12/21)			I L.V.P.C. (9/8/21)		8 mo.	Very advanced lesion, palliative.
33	60	8	5 mo.	3096 (9/23/24)						1 mo.	Died of senile dementia.
43	55	4	3 mo.	3075 (7/29/24) 3025 (8/26/24)	3150 (7/28/24)			I L.V.P.C. (7/31/24)	4 yr. 6 mo.		Tumor tissue involved cervix and stimulated carcinoma of cervix.
45	61		4 mo.	2550 (2/26/24)	821 (2/25/24)			I L.V.P.C. (2/28/24)	5 yr. 3 mo.		Uterus moderately enlarged.
57	79	2	1½ yr.		2032 (7/6/22)	15000 Pack (2/10/22) 10000 (7/6/22)				2 yr.	Advanced lesion treated by palliation.
66	58	4	6 mo.	1800 (1/31/21) 1512 (5/31/21)	3000 (6/7/21)	9400 Block (1/31/21)			6 yr.		Advanced lesion. Uterus size of grapefruit reduced to normal size. Killed in accident, seven years later.

TABLE II—CONT'D

CASE	AGE	DREN CHIL-	DURA- TION OF SYMP- TOMS	INTRAUTERINE TANDEM (MC.-HR.)	VAGINAL BOMB (MC.-HR.)	EXTERNAL RADIUM (MC.-HR.)	RADIATION EXTERNAL RADIATION	INTER- STITIAL RADIATION (MC.-HR.)	ALIVE	DEAD	REMARKS
100	59	5	18 mo.	2350 (2/11/22) 1843 (9/26/22) 3042 (4/24/23)		9400 Block (2/15/22)			6 yr.		Bleeding for 18 mo. before ad- mission. Note amount of radiation necessary to con- trol the disease in this case.
24	62	0	2 mo.	1032 (9/12/26) 2040 (10/12/26)			I H.V.P.C. (11/9/26)			1 yr. 8 mo.	Peculiar histologic structure, much mucus.
19 B	53	0	2 yr.	1890 (1/29/24) 2000 (10/28/24)			I L.V.P.C. (Feb. 1924) I L.V.P.C. (Oct. 1924)			14 mo.	Tumor tissue invaded cervix. Uterus normal size. Inade- quate radiation.
88	60	0	1 yr.	1812 (3/17/23) 2200 (3/24/25) 1050 (4/27/26)						1 yr. 5 mo.	Profuse purulent discharge from uterus. Fundus normal in size. Death from bladder hemorrhage.
87	69	9	2 yr.	Seven applica- tions before ad- mission Dosage ?			II L.V.P.C. (June 1918)			2 yr. (Final), probably dead	Advanced lesion, uterus mark- edly enlarged, inoperable.
89	64	1	2 yr. 6 mo.	1076 (Feb. 1918) 506 (Aug. 1918) 1545 (Feb. 1919)		20,000 Block (1918)				3 yr. 3 mo.	Uterus moderately enlarged, initial radiation inadequate.
93	54		3 mo.	2520 (2/25/22) 1496 (10/31/22)			I H.V.P.C. (6/16/26) I H.V.P.C. (5/2/27)			5 yr.	Uterus small. Remained well and free of disease four years.
37	52		1½ yr.	1488 (6/ 7/20) 1995 (1/27/23)					3 yr.		Patient developed vesicovaginal fistula. Hysterectomy Jan., 1923. No evidence of tumor found. Fistula due to faulty application.

TABLE III. ADENOMA MALIGNUM TREATED BY RADIATION AND HYSTERECTOMY

CASE	AGE	CELL- DREN	DURA- TION OF SYM- TOMS	INTRAVETERINE TANDEM (MC.-HR.)	VAGINAL BOAMB (MC.-HR.)	EXTERNAL RADIATION RADIUM (MC.-HR.)	EXTERNAL RADIATION X-RAYS	INTER- STITIAL RADIATION (MC.-HR.)	OPERATION	RESULTS		REMARKS
										ALIVE	DEAD	
3	50			3072 (2/16/26)	1500 (2/15/26)				Complete hysterectomy (4/20/26)	3	yr.	Uterus normal size.
19A	43	0	1 yr.				I. L. V. P. C. (3/17/24)		Complete hysterectomy (12/9/24)	4	yr.	Myoma and adenoma malignum.
42	43	4	1 yr.	3024 (8/14/23)	3000 (8/14/23)		I. L. V. P. C. (8/13/23)		Complete hysterectomy (10/2/23)	5 1/2	yr.	Bulky tumor, extension through external os of cervix, simulating car- cinoma of cervix.
53	55	2	7 mo.	1350 (12/20/21)					Complete hysterectomy (2/28/22)	7	yr.	Not advanced, myoma and adenoma malig- num. Breast amputa- tion for carcinoma of breast 6/3/22.
54	46	0	1 yr.	1496 (6/14/21) 1780 (12/6/21)					Complete hysterectomy (7/21/22)	7 1/2	yr.	Not advanced. Radiation followed by pyometra.
71	42		6 mo.	3163 (7/10/23)					Complete hysterectomy (2/15/27)	5	yr.	Uterus slightly enlarged. Bleeding continued 3 yr. after radiation. Hysterectomy followed by recurrence.
75	49			4068 (4/28/23)					Complete hysterectomy (9/11/23)	5	yr.	Operation performed else- where. Data incom- plete. Patient is well five years after treat- ment.

of 3350 mc. hr. was made. The patient is well and free of disease for six years. In Case 66 the uterus was as large as a grapefruit and was reduced to normal size by two intrauterine applications of radium, one vaginal application and one external treatment, totaling 15,700 mc. hr. The patient remained well and free of disease for six years and later died in an accident. In Case 43 an advanced lesion invading the cervix was treated with two intrauterine applications of radium totaling 6100 mc. hr. and one vaginal application with the bomb of 3000 mc. hr. (Total 9100 mc. hr.) The patient is well and free of disease, four and one-half years.

In direct contrast with the above three advanced cases cured by intensive irradiation, it is of interest to analyze four cases (Cases 5, 19B, 89, and 93, Table II) which were distinctly undertreated. It will be noted, for instance, that in Cases 5, 89, and 93 the disease was controlled for three to five years in each instance by small doses, after which the disease recurred and progressed to a fatal termination. Judging from the ability to control the disease for three to five years by relatively small doses and the results in the three advanced lesions cured by intensive irradiation, it is logical to assume that these failures may be attributed directly to the inadequacy of the radiation employed. These results, therefore, clearly indicate that if radiation is to be relied upon in the treatment of uterine cancer it must be delivered in quantity adequate to control the disease.

Cases Treated by Combined Radiation and Hysterectomy.—Of 7 patients with adenoma malignum treated by the combined method (Table III), 6 are alive and free of disease and one has developed a recurrence. Two patients had coexisting myomas and two developed pyometra after radiation, the operation in these cases being performed for these complications. There were no operative deaths. With the possible exception of Case 42, none of the lesions was advanced.

TABLE IV. RESULTS OF TREATMENT IN 24 CASES OF ADENOMA MALIGNUM, GRADE II

TREATMENT	ALIVE	DEAD
Radiation and hysterectomy	7	0
Radiation alone	8	9

Whereas, at first glance, a comparison of the two methods of treatment as indicated in Table IV distinctly favors combined radiation and hysterectomy, a closer analysis of the individual cases reveals the importance of considering every possible factor in evaluating the merits of each. Thus it is seen that of the 24 patients only 7 were subjected to hysterectomy, whereas 17 were treated by radiation alone. It is clear from this that the patients in the former group were operable and consequently in an earlier stage of the disease than the latter. Actually there were no distinctly advanced cases in the former group.

TABLE V. ADENOCARCINOMA TREATED BY RADIATION ALONE

CASE	AGE	CHILDREN	DURATION OF SYMPTOMS	INTRAVETERINE TANDEN (MC.-HR.)	VAGINAL BOMB (MC.-HR.)	EXTERNAL RADIATION (MC.-HR.)	EXTERNAL RADIATION X-RAYS	INTERNAL RADIATION	ALIVE	DEAD	REMARKS
10	53		8 yr.	3000 (8/9/24)	2000 (8/11/24)		I L.V.P.C.			9 mo.	Advanced lesion. Irregular bleeding for eight years. (Exploratory inoper.)
16	56	6	3 mo.	2989 (3/24/28)	3000 (3/16/23)	9000 Pack (6/16/25) Inguinal node	I L.V.P.C. each year (1923- 1926)	1100 B.T. (4/28/25) into v a g- inal recur- rence.		3 yr. 7 mo.	Advanced case. Metastasis to inguinal nodes and pelvic bones.
21	64	3	1 mo.	880 (6/16/25) 1690 (7/28/25)						4 mo.	Patient died of diabetes.
23	52	13	3 mo.	1925 (9/5/22) 2760 (10/10/22)						6 mo.	Advanced lesion. Highly cellular tumor.
25	58	0	1 yr.	3000 (5/23/22) 2040 (5/8/23)	3000 (5/27/22)		II L.V.P.C. May, 1922 I L.V.P.C. Dec., 1923			2 yr. 6 mo.	Advanced lesion controlled for 2½ years. (Exploratory inoper.)
30	65	2	3 yr.	7000 (10/21/27) 920 (11/6/27)			IV H.V. X-ray ex- posures in another in- situation			5 mo.	Reported to have died of bronchopneumonia.

TABLE V—CONT'D

34	71	8	5 mo.	2662 (5/ 6/24)				I L.V.P.C. (5/8/24)			± mo.	Advanced lesion, palliative.
48				1600 (10/ 8/24) 2048 (11/29/24)							2 yr.	Treated under diagnosis of myoma. Disease controlled two years, patient lost track of, regarded as dead.
50	63	6	3 mo.	3360 (8/12/24)				I L.V.P.C. (9/10/24)			4 mo.	Advanced lesion (data incomplete).
51	43	1	4 mo.	2511 (10/ 2/23)				I L.V.P.C.		5 yr.		Uterus was small, probably an early lesion. Adenoma malignum and adenocarcinoma.
56	57		1 yr.	2952 (4/ 4/22)				I L.V.P.C. (4/24/22)			5 mo.	Advanced lesion, metastasis to clavicle and tibia.
60	68	6	2 yr.	4040 (6/22/23) 2240 (11/ 2/23) 2904 (4/24/24)							1 yr. 9 mo.	Advanced lesion. Hysterectomy attempted. Condition found to be inoperable.
69	60	0	1 yr.	1350 (8/27/20) 1192 (5/24/21) 1368 (7/19/21)						938 B.T. (1/31/22)	1 yr. 8 mo.	Uterus small on admission.

TABLE V—Cont'd

CASE	AGE	CHILDREN	DURATION OF SYMPTOMS	INTRAVETERINE TANDEN (MG.-HR.)	VAGINAL BOMB (MG.-HR.)	EXTERNAL RADIATION RADICAL (MG.-HR.)	EXTERNAL RADIATION X-RAYS	INTERNAL RADIATION	ALIVE	DEAD	REMARKS
70	55	3	3 yr.	1820 (10/10/20) 1272 (12/ 2/20) 1008 (4/26/21) 1740 (9/13/21)						2 yr. 6 mo.	Very extensive lesion. Fundus ten cm. above symphysis. Palliative.
78	74		6 wk.	1008 (9/22/19) <i>Silver wire application</i> 624 (10/20/19) 1843 (11/29/20)			18,000 Block (9/22/19)			3 yr. 7 mo.	Moderately advanced. Uterus size of small grapefruit. Pyometra.
81	70	2	18 mo.				I. I. V. P. G. (Oct., 1925)			8 mo.	Advanced lesion. Poor general condition; palliative.
82	58	0	6 mo.	5800 (12/30/24)						14 mo.	Advanced lesion.
84	57	0	2 yr.	6760 (3/16/26) 2500 (6/11/26)		20,000 (Dist. 10 cm.) Pack Suprapubic (July, 1926)				1 yr. 5 mo.	Probably advanced lesion. Treatment complicated by pyometra. Failed to return. Probably dead.

TABLE V—CONT'D

18	58	2	2 yr.	3045 (1/10/22)					7 yr.	1 yr. 2 mo.	Uterus not enlarged. Probably an early lesion.
68	57	2		4000 (1/28/20)							Uterus not enlarged. Patient returned only once after treatment.
91	59		1 yr. 8 mo.	2108 (12/15/22) 2012 (12/15/22)						1 yr. 8 mo.	Uterus enlarged, probably advanced lesion. Died of general carcinomatosis.
92	63			4650 (1/ 2/23)						1 yr. 3 mo.	Diabetes. Uterus somewhat enlarged. Cause of death unknown.
96	57	1	1 yr.	2320 (12/ 7/21) 3060 (11/15/22)	18,000 Pack Dist. 10 cm. (9/16/22)					1 yr. 5 mo.	Extent of disease not noted.
97	59	7	6 mo.	1617 (3/ 1/21) 2000 (9/13/21)	10,000 Block (2/28/21)					2 yr. 8 mo.	Fundus 5 cm. above symphysis pubis, probably an advanced lesion.
98	54		1 yr. 2 mo.		948 (12/20/20) 1800 (4/26/21)				7½ yr.		Extent of disease not noted. Patient died of cancer of breast later.

and at least 7 in the latter. Furthermore, an analysis of the 9 failures in the group treated by radiation alone shows that 4 patients had very advanced lesions and were treated palliatively and four others received inadequate treatment. Thus 8 of the 9 failures can be accounted for either by the extent of the disease or the inadequacy of the treatment employed. When these failures are discounted it is quite evident that radiation alone compares very favorably with combined radiation and hysterectomy, as in the group of eight cases cured by radiation alone there are 3 in which the disease was advanced and inoperable, whereas in the seven treated by the combined method there were no advanced cases, all are alive but there is one with recurrence.

ADENOCARCINOMA, GRADE III

Cases Treated by Radiation Alone.—Twenty-five patients with adenocarcinoma of the uterus were treated by radiation alone (Table V) whereas only 8 were treated by radiation and hysterectomy. A comparison of these figures indicates that there must have been some factor which determined this unequal distribution as to method of treatment. An analysis of Table V promptly shows that the explanation for this is the high proportion of advanced cases in this group, only a small proportion being operable on admission. Twelve of the 25 patients are known to have had unquestionably advanced lesions. Of those, three were designated as "palliative," and three were determined to be inoperable at exploratory celiotomy. Several other cases which were probably advanced have not been so designated so that the 48 per cent is a minimum estimate of the proportion of advanced cases in this group. Of the 22 failures, at least 12 may be attributed to this factor alone. One patient died of diabetes, one of bronchopneumonia, and four were undertreated. Table VI presents the factors which may be held accountable for the results in this group of cases.

TABLE VI. SHOWING THE INFLUENCE OF VARIOUS FACTORS IN TWENTY-TWO FAILURES OF ADENOCARCINOMA TREATED BY RADIATION ALONE

NO. OF CASES	
Advanced stage of disease	12
Inadequate radiation	4
Diabetes	1
Bronchopneumonia	1
Fymetra	2
Undetermined	2

Three patients with adenocarcinoma of the uterus are well, five, seven, and seven and one-half years respectively, by radiation alone (Cases 18, 51, and 98). In one the extent of the disease was not noted, whereas in two the uterus was small and the lesions probably not advanced. These cases can, therefore, be attributed largely to the early stage of the disease. Case 18 is of special interest in that the duration of symptoms was two years in spite of which the uterus was

small and freely movable. A reexamination of the curettings in this case showed that although the structure was essentially adenocarcinoma the lesion was entirely papillary.

Cases Treated by Combined Radiation and Hysterectomy.—Of 8 patients treated by the combined method, three are alive and five died (Table VII). Two cases (Cases 31 and 79) do not fall strictly within this group as hysterectomy was performed several months before admission and the patients were admitted with well-established recurrences. Each of the other 6 patients received intrauterine radiation as the primary treatment followed by hysterectomy. Of the three patients who have survived, one (Case 46), an advanced case, developed a recurrence of the disease six and one-half years after a moderate amount of radiation. Hysterectomy was performed and followed by local recurrence. The unfavorable results obtained in this group of cases, even in some of the relatively early lesions, again points to the greater potential malignancy of adenocarcinoma as compared with adenoma malignum. A comparison of the results in the two histologic types by either method of treatment confirms this view.

Whereas Table VIII seems to show a distinct advantage of the combined method (radiation and hysterectomy) over radiation alone in the treatment of adenocarcinoma, a closer analysis of the cases is essential before drawing this conclusion. It has been pointed out in Table VI that 18 of the 22 failures can be accounted for as follows: advanced stages of the disease, 12 cases; inadequate treatment, 4 cases; and deaths from other causes, two cases. Thus 18 of the 22 failures may be attributed to factors which must be discounted in comparing the value of the two methods of treatment. When these factors are considered, the results in adenocarcinoma are about equal under each method of treatment.

COMPARISON IN PROGNOSIS OF ADENOMA MALIGNUM AND ADENOCARCINOMA

Table IX shows a striking difference in the mortality of adenoma malignum and adenocarcinoma. Adenocarcinoma is a more fatal disease than adenoma malignum. The results of this comparison confirm those of Lindsay, Mahle, and others. The probable explanation for this difference is indicated in Table X.

Table X shows that whereas the average duration of symptoms is six months less in adenocarcinoma than in adenoma malignum, the percentage of advanced cases on admission is twice as large as in adenoma malignum. This would appear to demonstrate that adenocarcinoma is the more fatal disease because it progresses more rapidly and reaches an advanced stage in a higher proportion of cases in a much shorter interval. Adenoma malignum shows 60 per cent cures as compared with 18 per cent in adenocarcinoma. It is interesting that three times as many cures were obtained in adenoma malignum as in adeno-

TABLE VII. ADENOCARCINOMA TREATED BY RADIATION AND HYSTERECTOMY

CASE	AGE	CHI- L- DREN	DURA- TION OF SYMP- TOMS	RADIATION						RESULT		REMARKS
				INTRATESTERINE TANDEM (MG.-HR.)	VAGINAL BOLE (MG.-HR.)	EXTERNAL RADIATION RADIUM (MG.-HR.)	EXTERNAL RADIATION X-RAYS (9/28/27)	INTER- STITIAL RADIATION (MG.-HR.)	OPERATION	ALIVE	DEAD	
31	63	1	1 yr.				I H.V.P.C. (9/28/27)		Complete hysterectomy (May, 1927)	9 yr. Re- cur- rence)	5 mo.	Very advanced case. Treated palliatively by external radiation.
46	49	5	3½ mo.	2000 (11/3/19) 1800 (11/21/20)	3000 (11/4/19)	9000 Block (11/22/20)		750 G.T. (1/20/28)	Complete hysterectomy (6/14/27)			Recurrence 6½ yr. after radiation. Hysterectomy fol- lowed by vaginal recurrence. Orig- inally advanced lesion.
58	45	1	4 mo.	3000 (11/21/22)	1000 (1/5/25)	9000 Pack (3/5/27)	I L.V.P.C. (1/7/25) I H.V.P.C. (3/7/27)		Complete hysterectomy (1/2/23)		5 yr.	Recurrence 18 months after hysterectomy. Not an advanced lesion originally 3 yr. palliation.
67	55	5	18 mo.	1848 (11/1/20) 1500 (11/22/21) 1032 (4/16/23)	2000 (11/3/20)				Complete hysterectomy (3/25/22)	4 yr.		Advanced lesion. Body of uterus en- larged. Uterine cavity 12 cm. long.

TABLE VII—CONT'D

AGE	CASE	CHILDREN	DURATION OF SYMPTOMS	RADIATION						RESULT		REMARKS
				INTRAUUTERINE TANDIEM (MC.-HR.)	VAGINAL BOMB (MC.-HR.)	EXTERNAL RADIATION RADIUM (MC.-HR.)	EXTERNAL RADIATION X-RAYS	INTERSTITIAL RADIATION (MC.-HR.)	OPERATION	ALIVE	DEAD	
85	67	0	7 mo. 1932 (3/16/26)					1082 G.S. (12/7/26) 641 G.S. (1/10/27) 1128 G.S. (6/17/27)	Complete hysterectomy (11/15/26)		1 yr. 8 mo. (P.O.)	Not advanced. Hysterectomy 8 mo. after radiation followed by vaginal recurrence.
94	59	2	1 yr. 2 mo. 3124 (11/10/22)	2000 (11/6/22)					Complete hysterectomy (12/5/22)		1 yr.	Uterus size of a 3 mo. gestation. Complicated by myoma. Recurrence after hysterectomy.
101			2418 (2/6/23)						Complete hysterectomy (3/7/23)	6 yr.		Uterus small, movable, patient well six years after treatment.
79	42	1	2 yr. 770 (11/7/19) 900 (5/3/20)						Complete hysterectomy (9/6/19)		2 yr.	Radiation seven weeks after hysterectomy under diagnosis of myoma; recurrence nine months after operation.

carcinoma, whereas adenoma malignum showed half as many advanced cases on admission as adenocarcinoma. The relationship between stage of disease and prognosis is, therefore, maintained.

TABLE VIII. RESULTS IN TREATMENT OF 33 CASES OF ADENOCARCINOMA, GRADE III

TREATMENT	
Radiation and Hysterectomy	3
Radiation Alone	3
ALIVE	6
DEAD	27

TABLE IX. COMPARING THE RESULTS IN ADENOMA MALIGNUM AND ADENOCARCINOMA; SOME TREATED BY RADIATION ALONE, OTHERS BY COMBINED METHOD

HISTOLOGIC TYPE	
Adenoma Malignum	15
Adenocarcinoma	6
ALIVE	21
DEAD	27

TABLE X. COMPARING DURATION OF SYMPTOMS, STAGE OF DISEASE AND PROGNOSIS IN ADENOMA MALIGNUM AND ADENOCARCINOMA

HISTOLOGIC TYPE	DURATION OF SYMPTOMS	PERCENTAGE OF ADVANCED CASES	PER CENT CURED
Adenoma Malignum, Grade II	19 months	23	60
Adenocarcinoma, Grade III	13 months	45	18

Diffuse (Anaplastic) Carcinoma, Grade IV.—This group comprises 12 per cent of the entire series (Table XI). With the exception of one patient, nineteen years of age, there is no special significance in the ages. The average duration of symptoms was thirteen months. Six of the twelve patients had distinctly advanced lesions. In spite of this high proportion of advanced cases, six of the twelve are well.

The Cured Cases.—Of the cured cases, the lesion was distinctly advanced in two and comparatively early in four. One patient was cured by hysterectomy alone. One is well after excision of a pedunculated tumor followed by intravermine radiation and four are well after initial radiation followed by hysterectomy. The two advanced cases (Cases 15 and 72) are of special interest. One (Case 72) is well five years after treatment which consisted of one low voltage x-ray cycle to the pelvis, followed three weeks later by complete hysterectomy. The small amount of external radiation caused a rapid and marked diminution in the size of the uterus and a pronounced clinical improvement. Microscopic examination of the uterus showed massive necrosis of tumor with shadows of tumor cells presenting the characteristic histologic features of a radiosensitive tumor. The other patient (Case 15) had a very advanced lesion, the fundus of the uterus extending 8 cm. above the symphysis pubis. This patient remained well for five years under radiation alone, after which hysterectomy was performed for a suspected pyometra. The patient is well six years since operation and eleven years since the initial radiation treatment.

These two cases illustrate the effect of even small doses of radiation upon this type of growth and demonstrate the value of radiation alone or as an adjunct to surgery in the treatment of this group of cases. Both patients on admission had inoperable lesions and both were rendered operable by radiation therapy. The ability to control the disease for five years by radiation alone in Case 15 is especially noteworthy as the lesion was in a very advanced stage on admission.

The Failures.—An attempt to account for six failures in this group shows that two cases (Cases 29 and 99) were in a very advanced stage of the disease on admission and were designated as palliative. They were treated by radiation alone and lived four months and two and one-half years respectively. Two other patients with advanced lesions were treated by hysterectomy and postoperative radiation and died

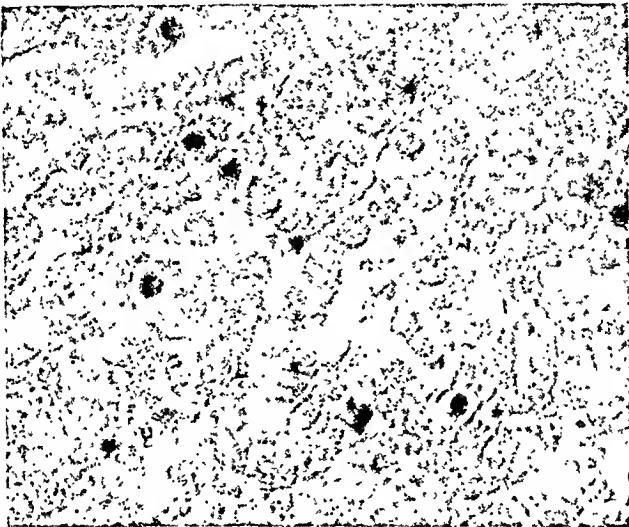


Fig. 5.—Showing almost complete necrosis of tumor after a moderate amount of radiation. Structure shows shadow cells with nuclear remnants. Highly radiosensitive.

five and seven months respectively after operation (Cases 28 and 95). In one case (Case 22) the disease was controlled for two and one-half years by a relatively small amount of radiation. The lesion was not advanced, on admission, the uterus being small and freely movable. The initial treatment consisted of only 1840 me. hr. of radium applied in the uterine canal. The patient did not return for six months when a second intrauterine application of radium was performed. She refused hysterectomy. It is believed that in this case the initial treatment was inadequate and that the failure is to be attributed to this factor. In Case 35 the uterus (Fig. 8) was somewhat enlarged by a pedunculated, papillary mass filling the uterine cavity and projecting through the external os. Complete hysterectomy was done, no radiation was employed. Histologically this tumor proved to be a highly cellular, diffuse adenocarcinoma. In view of the histologic structure it is be-

TABLE XI. ENBRYONAL CARCINOMA, GRADE IV

CASE	AGE	CHILDREN	DURATION OF SYMPTOMS	INTRAVAGINAL TUMOR (MC.-HR.)	VAGINAL BOMB (MC.-HR.)	EXTERNAL RADIATION (MC.-HR.)	EXTERNAL RADIATION X-RAYS	INTERNAL RADIATION (MC.-HR.)	OPERATION	ALIVE	DEAD	REMARKS
9	45	0	8 mo.						Complete hysterectomy; (10/20/25)	3 yr. 3 mo.		Uterus enlarged to size of a 3 months' gestation.
7	19	0	4 mo.	2184 (6/12/23)					Local excision (5/12/23)	5½ yr.		Local excision of pedunculated tumor of uterus, followed by radiation. Misc. Embryona. Ca.
28	55		3 yr.				[H.V.P.C. (6/28/27)		Complete hysterectomy. (4/18/27)		7 mo.	Symptoms 3 yr. before operation. Advanced lesion. Hysterectomy followed by post-operative radiation.
22	70	8	1 yr.	1840 (9/8/25) 1896 (3/9/26)							2½ yr.	Uterus slightly enlarged. Patient refused hysterectomy developed abdominal metastases. Inadequate radiation.
35	55	0	7 wk.						Complete hysterectomy (9/26/24)		1 yr. 5 mo.	Papillary, pedunculated tumor filling the uterine cavity. Misc. embryonal adenocarcinoma.
72	65	3	1 yr. 6 mo.				[L.V.P.C. (10/1/23)		Complete hysterectomy (10/23/23)	5 yr.		Advanced lesion. Uterus size of 3½ mo. gestation. Remarkable regression following external radiation.

TABLE XI—CONT'D

CASE	AGE	CHILDREN	DURATION OF SYMPTOMS	INTRA-UTERINE TANDEN (MC.-HR.)	VAGINAL BOMB (MC.-HR.)	EXTERNAL RADIATION RADIUM (MC.-HR.)	EXTERNAL RADIATION X-RAYS	INTERSTITIAL RADIATION (MC.-HR.)	OPERATION	ALIVE	DEAD	REMARKS
74	60	2	1 yr.	3082 (5/8/23)		Radiation			Complete hysterectomy (12/2/24)	4 yr. 3 mo.		Not advanced. Pyometra developed 18 mo. after radiation, hysterectomy.
95	49	2	2 yr.		3000 (1/30/28)	10000 Paek (2/19/28) 10000 Paek (2/22/28)	I L.V.P.C. (2/6/28)		Partial hysterectomy (1/21/28)		5 mo.	Very advanced lesion and tumor reaching to umbilicus. Palliative hysterectomy.
99	49		9 mo.	2050 (10/11/21)	2000 (10/11/21)	9000 Block (12/10/21)			Complete hysterectomy (4/4/22)	5 yr. 9 mo.		Advanced lesion. Uterus markedly enlarged and fixed.
101	47			2130 (3/14/22)								Not advanced. Uterus somewhat enlarged.
29	56	2	2 yr.				II H.V.P.C. (3/21/27)				4 mo.	Advanced lesion. Inoperable (determined by celiotomy). Histologically myosarcoma and adenocarcinoma palliative.
15	48		1 mo.	1500 (2/28/18)		16000 Block (3/1/18)			Complete hysterectomy (1/25/24)	11 yr.		Advanced lesion. Patient remained well 5 years after radiation. Hysterectomy for suspected pyometra.

TABLE XII. SHOWING RESULTS FOLLOWING INCOMPLETE HYSTERECTOMY AND RADIATION OF CERVICAL STUMP

CASE	AGE	CHILDREN	DURATION OF SYMPTOMS	HISTOLOGIC TYPE	RADIATION					RESULTS		REMARKS	
					CERVICAL (MC.-HR.)	VAGINAL BOMB (MC.-HR.)	EXTERNAL RADIATION (MC.-HR.)	EXTERNAL RADIATION X-RAYS	INTERNAL SPINAL RADIATION (MC.-HR.)	OPERATION	ALIVE		DEAD
1	51	3	4½ yr.	Adenoma Malignum	1388 (7/5/21)	3000 (7/4/21)	9000 Biobk (7/4/21)			Subtotal hysterectomy (Dec. 1918)	7½ yr.		Incomplete operation three years before admission. Recurrence 1 year later.
52	58	4	13 mo.	Adenoma Malignum	3000 (5/31/22)	3000 (6/2/22)				Subtotal hysterectomy (Nov. 1921)	5½ yr.		Incomplete operation 6 mo. before admission. Positive biopsy from cervical stump.
49				Adenocarcinoma	3000 (9/20/24) 4320 (3/14/25)					Subtotal hysterectomy (Mar. 1923)		9 mo.	Incomplete operation 18 mo. before admission. Positive biopsy from cervical stump.
63	42	0	1 yr.	Adenocarcinoma	2790 (11/18/24)					Subtotal hysterectomy (Nov. 1923)	4 yr.		Incomplete operation one year before admission. Positive biopsy from cervical stump.
26	46	5	9 mo.	Adenocarcinoma	1260 (2/15/22) 1000 (10/9/23)	3000 (2/20/22) 1540 (3/19/23)				Subtotal hysterectomy (Dec. 1921)	2 yr. 10 mo.		Incomplete operation. Recurrence following prophylactic radiation.

TABLE XIII. ADENOCARCINOMA

CASE	AGE	CHIL- DREN	DURA- TION OF SYMP- TOMS	RADIATION					RESULT		REMARKS	
				INTRAUTERINE TANDEM (MC.-HR.)	VAGINAL BOMB (MC.-HR.)	EXTERNAL RADIATION RADIUM (MC.-HR.)	EXTERNAL RADIATION X-RAYS	INTER- STITIAL RADIATION (MC.-HR.)	ALIVE	DEAD		
6	62	0	2 yr.	2420 (2/ 4/21) 2223 (8/25/22)	1500 (2/8/21)	10,000 Block (2/8/21)					3 yr.	Not advanced. Died with metastasis to liver and vertebrae (autopsy).
86	53	1	1 yr. 3 mo.	590 (Wire) (3/ 8/18) 1070 (Wire) (3/14/18) 517 (Wire) (10/ 5/18)	10,000 Block (3/12/18) 10,000 Block (3/23/18)						11 mo.	Advanced lesion. Fundus 10 cm. above symphysis.
90	60	4	1 yr.	3000 (12/18/23)		I L.V.P.C. (12/26/23)					1 yr. 6 mo.	Advanced lesion. Fundus 8 cm. above symphysis.

lieved that this failure may be justly attributable to the fact that radiation was not employed as a primary measure in the treatment of this case. Two advanced cases of the same histologic type cured by combined radiation and hysterectomy seem to justify this conclusion.

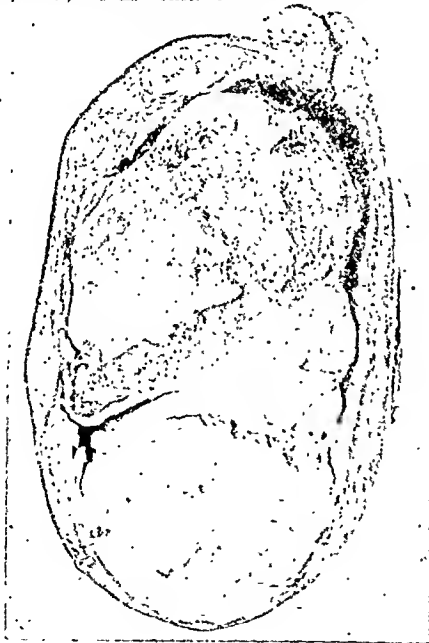


Fig. 6.—Gross specimen of uterus removed for pyometra five years after irradiation. (For histologic structure see Fig. 7.) Patient still living six years after operation.

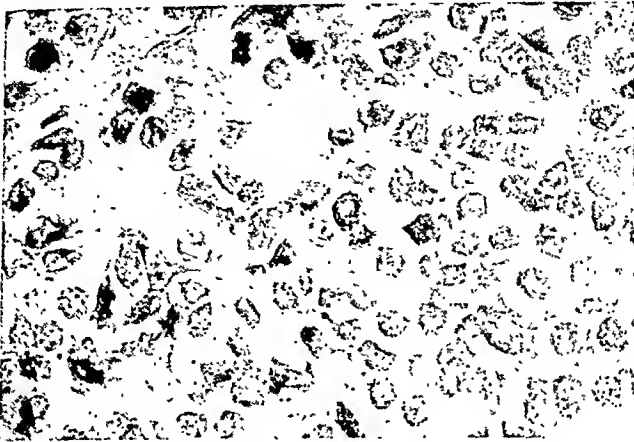


Fig. 7.—Diffuse, anaplastic carcinoma, Grade IV. (High power.) Highly radio-sensitive. (For gross specimen see Fig. 6.)

The analysis of this group of cases leads to the conclusion that this type of tumor is highly radiosensitive and yields the best results by radiation, either alone or followed by hysterectomy. The best results have been obtained by the combined method of treatment using intra-uterine radiation as the primary measure. It is also clear that radia-

tion is a distinctly better palliative agent than hysterectomy in advanced cases. It is quite obvious that the prognosis in advanced cases by radiation alone or by radiation followed by hysterectomy is relatively good, a fact which must be attributed to the radiosensitivity of the tumors. Hysterectomy alone is especially unsuitable, as is indicated by the result obtained in Case 35. The value of adequate radiation alone in the treatment of this group cannot be judged from the data, as all the operable cases were treated by the combined method. The ability to control the very advanced lesion in Case 15 for five years by a moderate amount of radiation alone indicates the value of radiation in advanced radiosensitive lesions.

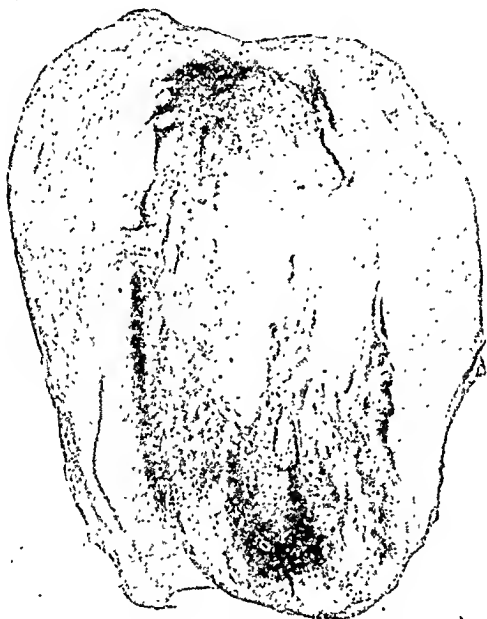


Fig. 8.—Showing pedunculated tumor of uterus, histologically diffuse anaplastic carcinoma. (See Fig. 4.) No pre- or postoperative radiation. Patient died eighteen months after hysterectomy from recurrence.

These results are especially significant when they are compared with the results of surgery alone in this group of cases. Thus Mahle reports *no cures in this histologic group by surgery alone*. This relationship is comparable with the results obtained in anaplastic carcinoma of the cervix by surgery and radiation respectively. Thus there exists in carcinoma of the fundus a small well-defined group of very malignant but highly radiosensitive tumors which have yielded practically no cures by surgical methods alone and 50 per cent cures by combined radiation and hysterectomy.

Incomplete Hysterectomy with Radiation of the Cervical Stump.—Table XII shows the results obtained in five cases in which partial hysterectomy was performed under an erroneous diagnosis, usually

that of myoma, with subsequent radiation of the cervical stump. It will be noted that in four instances a positive biopsy was obtained from the cervical stump on admission, whereas in one case (Case 46) prophylactic radiation was followed by a recurrence of the disease. It is significant that three patients are well four and one-half, five and one-half, and seven and one-half years respectively. These results would seem to indicate that the prognosis in patients who have been subjected to a partial hysterectomy is not necessarily unfavorable if operation is promptly followed by adequate irradiation of the cervical stump.

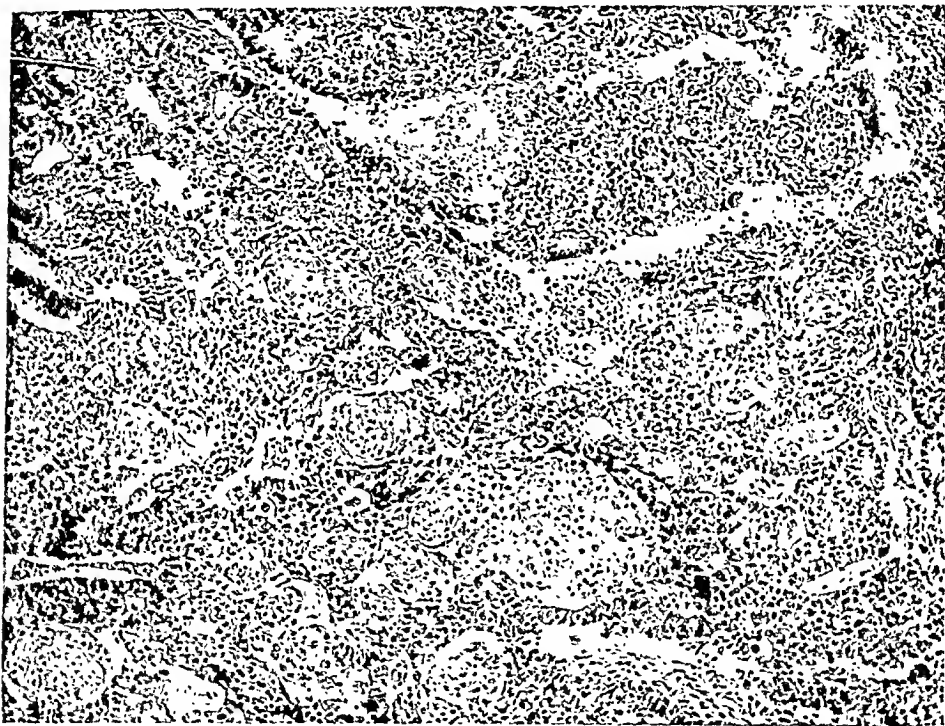


Fig. 9.—Adenocarcinoma, low power.

Adenocarcinoma.—Table XIII shows the results in three cases of adenocarcinoma. Two of the patients had advanced lesions and died eleven and eighteen months after radiation treatment respectively. One patient remained well for three years under a moderate amount of radiation and died with metastases to the liver and vertebrae, as shown at autopsy.

Table XIV shows the results in each histologic group, and demonstrates a definite relationship between structure and prognosis. Thus papillary adenoma malignum (Grade I) yields 98 per cent cures, adenoma malignum, Grade II, 65 per cent, and adenocarcinoma, Grade III, only 18 per cent. Diffuse or embryonal carcinoma, Grade IV, shows 6 cures out of 12 cases treated by initial radiation followed by hysterectomy.

tomy, a result which must be attributed essentially to the marked radiosensitivity of this histologic type. It will be noted that 49 out of 100 or 49 per cent of the entire series are well over three years. Of these, 43 are well over four years, and 36 over five years.

TABLE XIV. SHOWING THREE AND FIVE YEAR RESULTS IN THE VARIOUS HISTOLOGIC GROUPS OF FUNDUS CARCINOMA

HISTOLOGIC GROUP	NO. OF CASES	ALIVE		PER CENT WELL
		3 YR.	5 YR.	
Pap. Adenoma Malignum (Grade I)	14	3	10	98
Adenoma Malignum† (Grade II)	26	3	14	65
Adenocarcinoma† (Grade III)	39	2	5	18
Diffuse Carcinoma (Grade IV)	12	2	4	50
Unclassified*	9	3	3	66
Total	100	13	36	49

*This group comprises nine cases in which a positive microscopic diagnosis was made but the histologic material was not available for grading.

†The apparent discrepancy in the number of cases of adenoma malignum and adenocarcinoma in this table and previous tables is due to the fact that in this table we have included two cases of adenoma malignum and six cases of adenocarcinoma described under adenocanthoma Table XIII, and under the section "Incomplete hysterectomy and radiation of the cervical stump" Table XII.

TABLE XV. SHOWING RESULTS IN FUNDUS CARCINOMA TREATED BY RADIATION ALONE IN MEMORIAL HOSPITAL, RADIUMHEMMET AND UNIVERSITÄTS FRAUENKLINIK, BERLIN

	TOTAL NO. OF CASES	PER CENT OPERABLE	PER CENT OF ALL CASES WELL	OPERABLE CASES		
				NO.	NO. OF CASES WELL	PER CENT WELL
Memorial Hospital						
New York	56	41	34	23	15	65.0
Radiumhemmet						
Stockholm	46	54	43	25	15	60.0
Universitäts						
Frauenklinik, Berlin	40	85	45	34	18	53.0
Combined Results	142			82	48	58.5

Table XV shows the results in fundus carcinoma treated by radiation alone in the three institutions indicated. It is obvious that one of the most important factors in determining the percentage of cures is the relative proportion of early and advanced cases in each series. The composition of the material as to stage of disease is indicated by the percentage of operable cases in each group. (Memorial Hospital 41 per cent, Radiumhemmet 54 per cent, Universitäts Frauenklinik 85 per cent.) The comparatively low percentage of cures in the Memorial Hospital (34 per cent) as compared with 43 per cent and 45 per cent in the other two clinics, may therefore be accounted for by the fact that the cases were more advanced as indicated by the low operability, 41 per cent compared with 54 per cent and 85 per cent in the other two clinics.

The results of radiation alone in the operable cases are notably good. Combining the statistics of the three institutions, there are 82 operable cases treated by radiation alone, of which 48 or 58.5 per cent are well.

These results compare favorably with the best surgical statistics in fundus carcinoma (Mahie 61 per cent, Stacy 50.2 per cent, Davis 45 per cent).

CONCLUSIONS

Cancer of the body of the uterus is most common between the ages of fifty and sixty, 25 per cent occur in nulliparæ. Vaginal bleeding and discharge are the outstanding clinical symptoms.

After separating adenocarcinoma and adenomyocarcinoma from the main group, carcinoma of the fundus may be conveniently divided into four histologic grades, representing four degrees of potential malignancy.

Superficial papillary adenoma malignum (Grade I) comprises 14 per cent of the cases, and is the most benign histologic and clinical type. Curettage and adequate intravertine irradiation followed promptly by high voltage x-ray is the treatment of choice and offers an excellent prognosis in this group.

Adenoma malignum, Grade II, is intermediate in degree of malignancy between Grades I and III, and offers 65 per cent cures by radiation and combined radiation and hysterectomy. Twenty-three per cent of the cases had advanced lesions. The average duration of symptoms was nineteen months.

Adenocarcinoma, Grade III, is a more fatal disease than adenoma malignum, yielding only 18 per cent cures. Forty-six per cent had advanced lesions on admission. The average duration of symptoms was thirteen months.

Diffuse or anaplastic carcinoma, Grade IV, is the most malignant type and the most radiosensitive. It comprises 12 per cent of the entire series. Six patients, several with advanced lesions, are cured by radiation and combined radiation and hysterectomy. These results are highly significant when compared with operative statistics in which no cures in this histologic type by surgery alone have been reported. Hysterectomy alone is, therefore, distinctly contraindicated in this group.

Adenocarcinoma is a more rapidly growing tumor than adenoma malignum, reaching an advanced stage in a shorter time. The difference in prognosis may, therefore, be explained by the difference in degree of malignancy as indicated by rate of growth.

With the exception of the diffuse type (Grade IV), fundus carcinoma is moderately radioresistant, consequently, if radiation is to be relied upon in the complete sterilization of these tumors it must be delivered in an adequate amount.

The results obtained in each histologic group by either method of treatment confirm the validity of a separation based upon histologic structure and demonstrate the practical importance of adopting a suitable method of treatment to each clinical and pathologic type.

The prognosis in cases of fundus carcinoma by partial hysterectomy may be rendered favorable by prompt radiation treatment of the cervical stump. Three out of five patients so treated have remained well over five years.

Inoperable fundus carcinoma, including cases in which the operation offers technical difficulty, is best treated by radiation alone, the results to be expected depending upon the extent of the disease, the radiosensitivity of the tumor and the adequacy of the radiation. In the highly radiosensitive type a cure in a small percentage of advanced cases may be expected.

Intrauterine radiation is the method of choice in the treatment of papillary adenoma malignum (Grade I). In the other three histologic types, radiation alone and combined radiation and hysterectomy have yielded approximately similar results.

The combined results in 82 cases of operable fundus carcinoma treated by radiation alone show 58.5 per cent cures. These results compare favorably with the best statistics in the surgical treatment of this disease and demonstrate that the prognosis of fundus carcinoma may be at least as good by radiation as by surgical methods.

The decision between radiation and operation in operable fundus carcinoma must for the present depend upon the circumstances in each individual case, taking into account such factors as histologic type, technical operability, stage of disease, general or constitutional and local complications.

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MEMORIAL HOSPITAL.

THE discussion as to whether pregnancy is beneficial or harmful in tuberculosis and whether or not the interruption of pregnancy in tuberculosis is warranted, has gone on for decades and still continues. As no one man or institution has a sufficient number of cases to be convincing, it was thought possible that a questionnaire sent to tuberculosis sanatoriums and hospitals might assemble material of value for judging of the effect of pregnancy on tuberculosis from the clinical standpoint. Over 500 forms were sent out to all large and medium-sized sanatoriums listed in the directory of the National Tuberculosis Association, to large lying-in hospitals, and to leading obstetricians.

The questionnaire called for the listing of cases with classification on admission and discharge, statements as to tubercle bacilli in the sputum, cavities, fever, weight, duration of life after pregnancy, etc. Altogether 535 cases of tuberculosis with pregnancy were listed from 53 different sanatoriums and hospitals.

Of the 535 cases reported, 436 or 81 per cent came from sanatoriums or hospitals for tuberculosis and the remainder came from maternity or general hospitals with a lying-in service, where patients were followed after delivery through the out-patient service. Very few cases came through obstetricians, several of whom wrote that they rarely saw these cases or that they referred them to sanatoriums.

In many cases reported, data on all items were not given so that the same basic number could not be kept in all the tables and a considerable percentage of cases from lying-in and general hospitals could not be used at all in the tables, for this reason.

Many of the patients did not come under observation in the earlier months of pregnancy and many cases obviously could not be judged as well as though they had been under observation before, throughout and for a long time subsequent to pregnancy.

Of the 324 cases in which it was stated in what month of pregnancy the patient first came under observation, 6 patients were observed before, as well as during, pregnancy, 33 were first seen in the first month, 35 in the second, 49 in the third, 52 in the fourth, 32 in the fifth, 39 in the sixth, 27 in the seventh, 33 in the eighth, 15 in the ninth, and 23 in the tenth month of pregnancy.

PREGNANCY AND TUBERCULOSIS*

BY HARRY LEE BARNES, M.D., AND LENA R. P. BARNES,
WALTON LAKE, RHODE ISLAND

In 364 cases in which a statement as to toxemia of pregnancy was made, it was said to be present in 53 or 14.5 per cent and absent in 311 or 85.4 per cent.

Dubois said, "If a woman threatened with phthisis marries she may bear the first accouchement well; a second with difficulty; a third never." This remark has been so frequently quoted that I wish to cite the record of a patient not merely threatened with but actually suffering from advanced phthisis, who not only bore the third accouchement, but the fourth and even the fifth before succumbing.

CASE NO. 3389.—K. L., aged twenty. Single. Admitted January 31, 1917. Presumable duration before admission five months. Family history negative for tuberculosis. Examination showed dullness, bronchovesicular breathing, increased vocal resonance and many medium moist râles down to the fifth rib and the sixth vertebral spine. The left lung showed dullness, suppressed breathing and many medium moist râles down to the sixth rib on the left side. Tubercle bacilli were found in her sputum on February 2, March 28, and April 7, 1917.

Patient was readmitted as Case No. 8236 on July 24, 1926. The physical signs were much the same as on the first admission except that cavity signs were present at the right apex.

The x-ray showed in the right lung, mottling throughout, being especially dense from the second to the fifth ribs with honeycombing. Below the clavicle was a rarefied area $6\frac{1}{2}$ by 4 cm. The left lung showed mottling throughout, being especially dense between the second and fifth ribs. Tubercle bacilli were found in the sputum in each of 6 examinations.

She gave a history of having had 5 children in six years preceding readmission. One died of bronchopneumonia, and one, a seven months' baby, lived only a short time after the mother's readmission. The other 3 children were alive and well. This patient died in the Sanatorium August 6, 1927.

If we compare the results obtained in the 385 patients shown in Table I who did not have therapeutic abortions, with the results obtained on all patients treated in sanatoriums, we find that in minimal cases the disease was apparently arrested, quiescent, or improved in 78 per cent as compared to 92 per cent at the Trudeau Sanatorium in the years 1922-24-26-27. In the moderately advanced cases the disease was apparently arrested, quiescent, or improved in 65 per cent as against 75 per cent at the Loomis Sanatorium during 1921-22. In the far advanced cases there were 28 per cent apparently arrested, quiescent or improved as against 44 per cent at the Loomis Sanatorium in 1921-22.

Accepting these figures as they stand, pregnancy prevented the improvement of 14 per cent of minimal cases, 10 per cent of the moderately advanced cases and 16 per cent of the far advanced cases, as compared to the figures from the other sanatoriums quoted. This would rate pregnancy as an unfavorable factor in a small minority of cases.

It is proper to say, however, that as 6 pregnant women in this series left the sanatorium after a short stay, for confinement, and as 14 others

TABLE I. CONDITION ON ADMISSION AND ON DISCHARGE. 410 CASES*

	MINIMAL						MODERATELY ADVANCED						FAR ADVANCED						
	APPARENTLY ARRESTED	QUIESCENT	IMPROVED	UNIMPROVED	DEAD	TOTALS	APPARENTLY ARRESTED	QUIESCENT	IMPROVED	UNIMPROVED	DEAD	TOTALS	APPARENTLY ARRESTED	QUIESCENT	IMPROVED	UNIMPROVED	DEAD	TOTALS	GRAND TOTAL
Full term Number Per cent	15 31	5 10	19 39	8 16	1 2	48 98	11 7	21 14	65 44	38 26	11 7	146 98	3 2	10 7	33 23	62 43	34 23	142 98	336 98
Spontaneous abortion Number Per cent								1 50		1 50		2 100		1 50		2 40	2 40	5 100	7 100
Therapeutic abortion Number Per cent		1 50	1 50			2 100		1 16	3 50	2 33		6 99			11 64	3 17	3 17	17 98	25 99
Premature labors Number Per cent	1 33			1 33	1 33	3 99		1 19	2 95	1 12	4 50	8 99			4 12	12 38	15 48	31 98	42 98
Totals Per cent	16 30	6 11	20 37	9 16	2 3	53 99	11 6	24 14	70 43	42 25	15 9	162 99	3 1	11 5	48 24	79 40	54 27	195 99	410

*In order that a contrast might be drawn between abortions before and after the fifth month, all pregnancies terminating in the sixth month are classed with the premature labors.

shortened their stay after delivery, probably to care for the new baby, in some of the cases pregnancy prevented improvement indirectly by limiting treatment rather than by direct influence on the course of the tuberculosis.

Finally, a small percentage of this series reported from lying-in hospitals probably did not get sanatorium treatment at all. Taking these facts into consideration it appears that these pregnant women obtained results fairly comparable to those obtained in nonpregnant patients.

Although no attempt will be made to review the voluminous literature, yet it is of interest to note at this point that Prof. Forsner of Stockholm in his report of 341 tuberculous pregnant women, found that 86 per cent of first stage cases, 75 per cent of second stage cases, and 38 per cent of third stage cases, were either improved or stationary during one year's observation subsequent to confinement.

Norris and Landis found that 69 of 85 cases of tuberculosis, or 81.1 per cent were unchanged by pregnancy, two patients became worse and six died.

Norris and Murphy found that 92 of 166 or 55 per cent of tuberculous patients were unchanged by pregnancy.

Miss Alice M. Hill states that "A comparison of the condition of the 160 women whose pregnancies accompanied or immediately preceded their tuberculosis with that of their close controls at one year and at two years after diagnosis (and in the case of the pregnant women, after conception or confinement) leads to the conclusion that pregnancy had no appreciable bearing upon the progress of the tuberculous disease."

SPUTUM

The condition on discharge of 269 pregnant women with positive sputum and of 113 pregnant women with negative sputum was as follows:

TABLE II

SPUTUM	APPAR. ARRESTED	QUIES.	IMPR.	UNIMPR.	DEAD	TOTAL
Positive	10	28	39	62	80	269
Negative	20	10	48	28	7	112
Totals	30	38	137	90	87	382

The good results in the negative sputum cases (mortality 6.2) as compared to the bad results in the positive sputum cases (mortality 29.7) conform to the general experience with nonpregnant patients.

CAVITIES

Cavities during pregnancy were reported in 77 or 24.8 per cent of the 310 full-term cases. Of the 77 cavities found in full-term cases, 63 were found during pregnancy and 14 after delivery. Cavities were found in 3 or 27.2 per cent of 11 spontaneous abortions, in 12 or 27.5 per cent of 38 therapeutic abortions, and in 15 or 30 per cent of 50 premature labors.

X-RAY FINDINGS

For fear of making the questionnaire appear too discouragingly laborious, x-ray findings were not asked for, but comparative findings during pregnancy and after delivery were furnished in 34 cases.

Of 26 full-term cases the x-ray evidence in 15 showed improvement, in 3 extension, and in 8 no change. Of 3 spontaneous abortions, all showed improvement, of 3 therapeutic abortions 2 showed improvement and one no change, and of 2 premature labors one showed improvement and one no change.

The questionnaire asked for a statement of the duration of life after pregnancy and reports of 230 cases appear in Table III. In asking reports from so many institutions, it was not thought practicable to ask for a definite time after discharge when the condition of the patients should be ascertained, but many of the patients were reported living and well from two to nine years after pregnancy.

TABLE III. SUBSEQUENT HISTORIES

DURATION OF LIFE IN MONTHS OF THOSE WHO DIED	CASES		LIVING		DEAD	
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
	195	48.7	101	43.9	129	56.0
Full term	195	48.7	101	43.9	129	56.0
Spontaneous abortions	5	40.0	2	33.3	4	66.6
Therapeutic abortions	6	2	2	8.3	22	91.6
Premature labors	24	2	2	8.3	22	91.6
	230		101		129	
	22.8		16.7		7.7	

When it is realized that 42 per cent of the full-term cases, 71 per cent of the spontaneous abortions, 68 per cent of the therapeutic abortions, and 73 per cent of the premature labors, were far advanced cases, it is easy to understand the high mortality rates.

DEATHS

Among 328 women, 8 or 2.1 per cent died during pregnancy. All were far advanced cases. One patient died in premature labor at the sixth month, child stillborn. One patient having tuberculous meningitis died at the sixth month, the child in good condition was delivered by postmortem cesarean section. One died in labor at full term, undelivered. One died in labor at full term, child stillborn. The remaining 4 patients died undelivered. Sixteen others, or 4.8 per cent died within a week after delivery and in 6 of these cases the babies were reported to be in good condition. All of these were classified as far advanced cases when they first came under observation. A considerable percentage of all far advanced cases will die within a few months whether pregnant or not, and this death rate does not appear excessive.

Of 76,059 children born in Rhode Island in the five years, 1919-1923, 2676 or 3.5 per cent were stillborn. This slight increase in the per-

centage of stillborn children of tuberculous mothers may be accounted for by the mothers who died in late pregnancy and labor.

The 324 children above tabulated include those resulting from all pregnancies going to full term as well as all spontaneous abortions and premature labors in which the condition of the child at birth was known. In all spontaneous abortions at the fifth month or earlier the children were counted as dead by us unless there was a record to the contrary. If the 4 children who died unborn are added, we have 328 children of which 266 or 81 per cent were normal and vigorous at birth.

TABLE IV. CONDITION OF CHILDREN AT BIRTH

	BABIES	PER CENT
"Normal" or "Good"	266	82.0
Stillborn	22	6.7
Premature vigorous	13	4.0
Died within three days	10	3.0
Subnormal vigor	7	2.1
Other abnormalities	4	1.2
Twins	2	0.6
Total	324	99.6

The condition of these children of tuberculous mothers, at birth does not appear to have been materially different from that of children of normal mothers, and lends no support to the statements of some writers that such children are of subnormal vigor and die soon.

Physicians were asked to note in each case whether there was an increase or decrease of tuberculosis activity either during pregnancy or after delivery.

TABLE V. TUBERCULOSIS ACTIVITY

	NO. CASES	DURING PREGNANCY		AFTER DELIVERY				ACTIVITY NOT INCR. DURING PREG. OR AFTER DELIV.			
		NO.	PER CENT	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT		
Full term	275	80	29.0	66	24.0	102	37.0	45	16.3	152	55.0
Spontaneous abortion	11	4	36.3	0	0.0	4	36.3	2	18.1	7	63.0
Therapeutic abortion	31	10	32.2	1	3.2	13	41.9	6	19.3	13	41.9
Premature labor	48	37	77.0	2	4.1	41	85.4	4	8.3	5	10.4
Totals	365	131	36.0	69	18.6	160	43.8	57	15.6	177	48.4

Tuberculous patients are liable to have extensions of the infection to new areas and other things being equal, those women who carry a child to full term for ten months should have more extension to new areas and more reactivation of old lesions, than women in whom, because of abortions, the duration of the pregnancies are reduced to periods of from two to five months.

If we combine the 11 spontaneous abortions with the 31 therapeutic abortions, we have 42 pregnancies which were terminated by the fifth month or earlier, at a time when we might hope for a favorable influence. Of these 42 cases, in 14 or 33.3 per cent there was an increase in the activity of the tuberculosis noted during pregnancy, as compared with an increase in 29 per cent of pregnancies which went to full term. After the interruption of these 42 pregnancies, tuberculosis activity was present in 17 or 40.4 per cent as compared to 37 per cent in which increased tuberculosis activity was noted after delivery in full-term cases. A decrease in tuberculosis activity after interruption of pregnancy was noted in 8 cases or 19 per cent as compared to 16.3 per cent of cases in which a decrease of tuberculosis activity was noted in full-term cases.

The results in 410 and 365 pregnant women shown in Tables I and V, respectively, lend little support to the view that emptying the gravid uterus in either the minimal or the far advanced cases has value as a remedy for pulmonary tuberculosis. Most of the favorable cases in this series tending toward arrest seem to have gone on to arrest in spite of the pregnancy and the majority of the actively progressive cases appear to have progressed with the empty as surely as with the gravid uterus.

It is difficult to see how terminating a pregnancy in far advanced cases with fever and cavities, can offer much hope when we know that in women who are not and never have been pregnant, most of these cases progress to death in a few months, or a year or two at the most. If then we follow the implications of these statistics that most of the minimal cases do not need interference and that most of the far advanced and unfavorable types of moderately advanced cases continue hopeless after abortion, we may consider therapeutic abortion as a remedy for a small minority of cases, febrile, with only a limited spread of the lesions to x-ray, and still curable if the reactions or recent extensions could be checked. The questionnaire did not bring reports of such cases in sufficient number to be helpful in deciding this problem.

Many observers have reported good results from therapeutic abortions. It is also true that a considerable minority of observers report worse results after abortion. Of 35 therapeutic abortions in this series, the number of patients running a temperature over 99.5° F. before the abortion was 12, the number after the abortion was 20. The number running a temperature over 100° F. before the abortion was 4 and the number afterward was 10. Before abortion can be accepted as a remedy for these active febrile cases of tuberculosis with lesions not incurable in amount, it must be

shown in several hundred cases by different observers that the end-results after abortion are better than in similar cases allowed to go to full term.

This questionnaire did not ask for data as to the influence of pregnancy in causing the development of tuberculosis. As tuberculosis develops at all ages, it is natural that pregnancy should be blamed by the patients for a good part of the tuberculosis which develops in women of childbearing age. Probably most of the cases are merely coincidental. Even if we knew the incidence of tuberculosis among pregnant women as compared to nonpregnant women of the same ages, we could not decide the matter as to the influence of pregnancy in causing the development of tuberculosis because such statistics would not differentiate between the risks of bearing and the risks of rearing children. Many women while carrying one child are exhausting themselves caring for another in the home.

If we could have a series of women who bear the children but do not care for them, to compare with another series of women who care for children but do not bear them, we might accurately evaluate these dangers, and some of the women might get a very welcome relief from their double burden.

The following case is one in which there is some reason to believe that pregnancy was a causative factor in the development of clinical tuberculosis.

Patient aged eighteen, a girl of Italian parentage with no family history of tuberculosis and apparently in perfect health when married, began to vomit fifteen days after marriage and vomited nearly every meal until the baby was born, June 30, 1928. On marriage she weighed 146 pounds and after delivery 100 pounds. About April 1, 1928, she began to cough and expectorate and when I saw her seven months later she had far advanced disease with a cavity in each lung. It does not seem unreasonable to believe that a therapeutic abortion in this case might have saved a breakdown. Such cases are rare.

This questionnaire did not ask for reports of cases of pregnancy in latent tuberculosis or in arrested cases after their discharge from the sanatorium. Going over our cases treated at the State Sanatorium for twenty-three years, it was found that of 56 patients whose sputum was positive and who have had children since the onset of their disease, 18 or 31 per cent were living, while of all our tuberculous patients cared for during the same period, including both men and women, and nearly a third of whom were the more favorable negative sputum cases, only 26.4 per cent were living.

Of 53 patients whose sputum was negative and who are known to have had children, either during or since sanatorium treatment, 40 or 75.4 per cent were living. Most of these patients had their children a considerable period after their discharge. These statistics seemed surprisingly favorable but it is not claimed that they mean that preg-

nancy was beneficial. It is more likely that most of the patients with progressive lesions avoided conception and that those who became pregnant did so because they had been doing well a considerable time. The danger of pregnancy activating latent tuberculosis has been greatly exaggerated.

In patients whose sputum has never been positive and who have had no active symptoms within three years, the risk of pregnancy is comparatively slight.

All sanatoriums ought to care for tuberculous women during pregnancy, unless this important duty is performed for the locality by some other institution. Patients should be cared for in sanatoriums during labor rather than have the patients return home for confinement. Once at home with a new baby, a large percentage of women do not return for treatment.

If lying-in hospitals situated within a few hours' journey of sanatoriums will care for tuberculous women during the lying-in period, and if the women are able to go and return to the sanatorium before and after confinement, this arrangement is very satisfactory.

What is obviously needed to settle many problems relating to pregnancy and tuberculosis, is a few thousand cases with complete records as to history, physical and x-ray examinations, and end-results. The Sanatorium Association ought to act on Miss Hill's excellent suggestion, by appointing a committee to prepare blanks to be filled out by sanatoriums for all pregnant women. Judging by the scores of friendly responses to my questionnaire, for all of which I wish to make grateful acknowledgment, valuable data could be accumulated in a few years.

COMMENT

The questionnaire did not ask whether the mothers cared for their babies. Probably few did so, as most sanatoriums would not keep the babies. It is not uncommon to know of a woman in apparent health being worn out by the care of a baby, especially a sick baby.

If a woman with active tuberculosis and possibly febrile, must give up sanatorium treatment, or rest treatment in the home, in order to care for a baby all day and perhaps be kept awake at night, the baby is obviously a great danger to the mother.

It is not the baby in the uterus but the home which seriously endangers the life of a woman with active tuberculosis. The death of the baby either before or after delivery, obviously removes this danger.

SUMMARY

The results of the questionnaire pertaining to 410 pregnant tuberculous women are summarized as follows:

1. Toxemia of pregnancy was present in 14.5 per cent.

2. Seventy-nine per cent of the minimal cases, 65 per cent of the moderately advanced cases, and 28 per cent of the far advanced cases improved during pregnancy.

3. The relative frequency of improvement in the positive and negative sputum cases corresponded closely with that of nonpregnant patients.

4. X-ray evidence of clearing in the lung was noted in 15 of 26 full-term cases in which data were available.

5. Subsequent history reports at variable periods after confinement showed that 48 per cent of full-term patients, 40 per cent of patients who had spontaneous abortions, 33 per cent of patients who had therapeutic abortions, and 8 per cent of patients who had premature labors, were living.

6. Of 358 pregnant patients, 8 died undelivered and 3 died in labor, all these deaths occurring in far advanced cases.

7. Of 324 children, 82 per cent were "normal" or in "good condition" at birth and 6.7 per cent were stillborn.

8. The number showing marked tuberculosis activity after delivery in 42 pregnancies terminated not later than the fifth month, was 17 or 40.4 per cent, against 37 per cent of 275 full-term cases.

9. The number showing marked decreased tuberculosis activity after delivery in 42 pregnancies terminated not later than the fifth month, was 8 or 19 per cent against 45 or 16 per cent of 275 full-term cases.

10. Of 56 ex-patients of the R. I. State Sanatorium with positive sputum who are known to have had children during or since sanatorium residence, 31 per cent were living, while of all tuberculous ex-patients, only 26 per cent were living.

11. Of 53 negative sputum cases known to have had children during or since sanatorium treatment, 40 or 75 per cent are living.

CONCLUSIONS

A woman with active tuberculosis should avoid pregnancy in order that she may be spared the extra work and worry of a baby, and that the baby may be spared the risk of infection.

The problems of tuberculosis and pregnancy need further clinical research, but the data obtained from this series of 410 pregnant tuberculous women suggest that pregnancy in itself has a harmful influence, if at all, in only a small percentage of cases and that abortion being unnecessary in most favorable and futile in most unfavorable cases, is rarely beneficial to tuberculous women.

About 81 per cent of the tuberculous women who became pregnant and who were not subjected to therapeutic abortion, bore normal children. A policy which would sacrifice all these children on the apparently slight and still unproved chance of saving the mothers, is not easy to justify.

*Read before the Fifth Clinical Congress of the Connecticut State Medical Society, at New Haven, September 18, 1929.

The physiologic functions of the liquor amnii are: (a) The water cushion serves as a protection to the fetus against trauma. (b) The presence of the fluid permits movements of the fetus, and thereby tends to prevent faulty development. Cluifoot, Wryneck, and other

At term the amnion has become a thin, tough membrane, which, with the chorion, forms a sac-wall not more than a few millimeters thick at its thinnest point.

THE FUNCTION OF THE AMNIOTIC FLUID AND THE STRUCTURE OF THE MEMBRANES

Unknown	175
Known or suspected	21
Induction of labor	4
Twins	4
Contracted pelvis	3
Heavy hitting	2
Blow or fall	2
Fright	2
Toxemia	2
Abruptio placentae	2

TABLE I. CAUSES OF PREMATURE RUPTURE

PREMATURE rupture of the membranes may occur at any time during pregnancy. When it occurs during the early months of gestation it usually results in abortion, and when it takes place toward the end of the pregnancy, dry labor, as a rule, follows. There are on record the histories of a few cases in which rupture of the membranes has occurred early in the gestation, and the pregnancy has, nevertheless, continued to term, and resulted in the birth of a viable infant. In the early stages of pregnancy rupture of the membranes is less easily recognized than when it occurs later, at which time the amniotic fluid is present in larger amounts. Many of the former cases are probably not correctly diagnosed, and the resulting abortion is attributed to other causes. On the other hand, accidental premature rupture of the membranes is less likely to occur during the first few months of gestation, because of the protection afforded by the relatively thick meniscular envelope provided by the myometrium.

(Professor of Obstetrics and Gynecology, University of Pennsylvania)

By CHARLES C. NORRIS, M.D., PHILADELPHIA, PA.

WITH AN ANALYSIS OF A SERIES OF CASES AND A DISCUSSION OF THE TREATMENT

DRY LABOR*

developmental defects are not uncommon in cases of oligohydramnios. (e) The presence of the fluid also prevents the formation of adhesions, which may result in intrauterine amputations, harelip, hemiephalus, imperfect closure of the body cavities, etc., due to the presence of Simonart's bands (strands of adherent amnion). (d) The fluid prevents undue pressure on the fetal cord, (e) stabilizes the fetal temperature, and (f) renders quickening less painful to the mother. (g) It is a food that the fetus drinks (DeLee). (h) During labor the encapsulated fluid forms a wedge that facilitates dilatation of the cervix and prevents undue pressure upon the fetal head (in cephalic presentation). (i) To some extent the membranes afford a protection against bacterial invasion, both of the fetus and of the uterine cavity. (j) It flushes out the lower genital tract, thus reducing the likelihood

TABLE II. COMPLICATIONS*

(Other than premature rupture of the membranes, malposition or disproportion)

	NO. OF CASES
Toxemia, antepartum	28
Syphilis	22
Hydramnios	20
Anemia, various causes	20
Placenta previa	6
Cardiac disease	4
Carcinoma of the cervix	2
Myoma uteri	2
Pyelitis, antepartum	2
Total	106

*In some cases 2 or more complications were present. Thus, both of the carcinoma patients were anemic, and 8 of the toxemia patients exhibited positive Wassermann reactions. A corrected study shows that 60 (30 per cent) of the series were complicated. The percentage of hydramnios (9 per cent) is significant and indicates that this is a distinct cause for premature rupture of the membranes. The proportion of antepartum toxemia is also high.

of infection. This last function is chiefly mechanical, although it is asserted that the liquor amnii is slightly bactericidal in action. It can thus readily be understood that the presence of a normal quantity of liquor amnii and integrity of the membranes are of vital importance to the well-being of both the fetus and the mother, and that premature rupture of the bag of waters may be followed by disastrous consequences, and at best, subjects both mother and child to increased hazards.

Before considering premature rupture of the membranes it is advisable to review briefly the physiology of normal rupture. This usually occurs at the end of the first stage of labor, but may take place later.

The amount of fluid that at first escapes following a normal rupture varies greatly with the quantity of fluid present in the uterus, with the form of presentation, and with the point of rupture. If the presenting part fits very closely, or the membranes are firmly adherent,

no projecting wedge or bag of waters is formed, and the labor is usually protracted. After rupture takes place, a slight interval generally elapses during which the uterus adjusts itself to the reduced size of its contents, after which the labor, as a rule, progresses more rapidly.

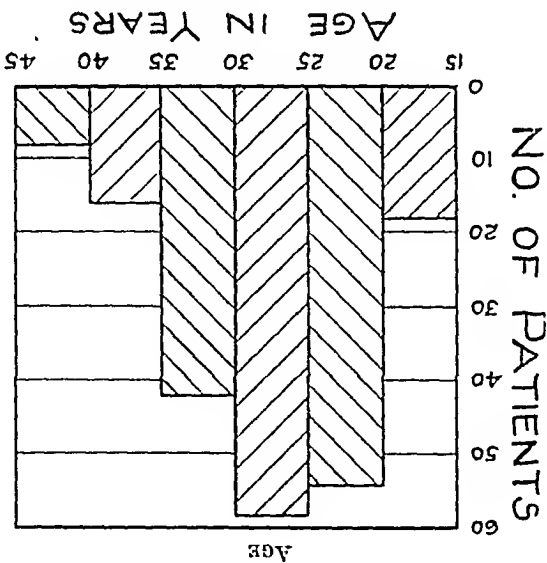


Fig. 1.—Youngest patient was seventeen years of age. There were 78 per cent of the patients between the ages of twenty and thirty-five years.

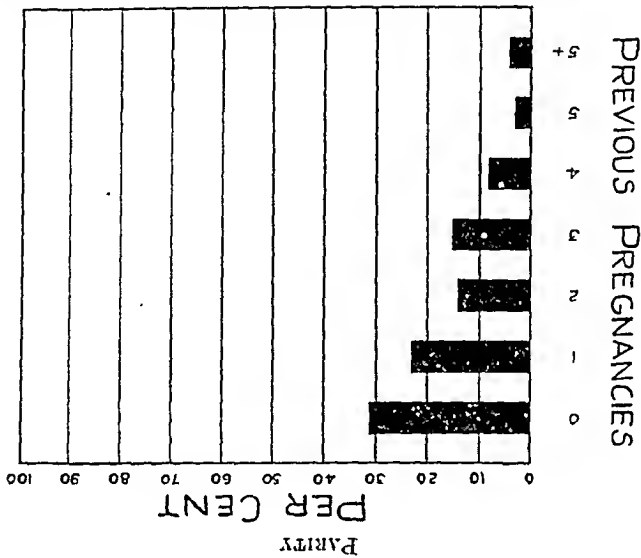


Fig. 2.—In this series there were two para 10 and one para 11. Sixty-one or 31 per cent were primiparae.

The cause of premature rupture cannot always be determined. In some cases it is clearly the result of trauma, either purposely or accidentally inflicted. This, however, accounts for only a minority of the cases. In the remainder, the etiology may be due to a number of conditions, such as disease of the membranes, unusual thinness or fri-

ability of the tissues and lack of tensile strength, or to such conditions as increase intrauterine pressure, for example, the presence of twins, monsters, hydramnios, or unduly strong uterine contractions.

Premature rupture of the membranes has been attributed to many other causes. Schulze¹ believes that prematurity is a consequence, rather than a cause, of rupture. Bassett² found premature rupture of the membranes most frequent in young primiparae. This finding has not been confirmed by Schulze, nor has it been found to be the case in our own series of cases. Pelvic contractions or moderate disproportion between the size of the presenting parts and the outlet probably predispose to early rupture after the onset of uterine contractions, but do not explain satisfactorily those cases in which rupture occurs prior

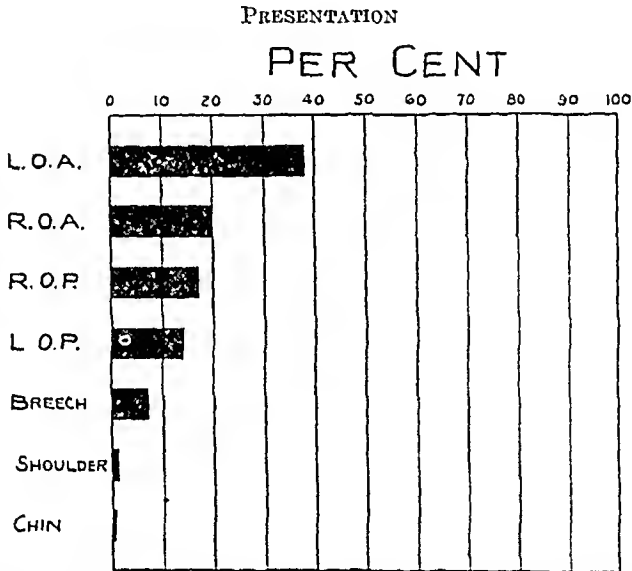


Fig. 3.—There were 177 cephalic presentations. Of these 62 or 32 per cent were posterior positions. Fourteen or 7 per cent were breech presentations, and classing the occiput posteriors as normal, there were 17 or 9 per cent distinctly malpresentations in this series. In 3 cases the presentation was unrecorded in the histories.

to the onset of pains. Disproportion and lack of engagement of the presenting parts may be factors in some cases. Reference has previously been made to abnormalities in the structure of the membranes. In 1923 Niderhe³ observed a deficiency in the connective tissue, particularly in that of the subamniotic layer. In two cases studied by the writer he was unable in either to satisfy himself that such changes were present. In passing it may be stated that a number of supposedly normal membranes were studied histologically, and in these apparently quite marked differences were observed in thickness, density, and amount of connective tissue. Naujoks⁴ noted various degenerative changes. Hyaline degeneration has been observed by a number of investigators, including Belosor.⁵ Heinlein⁶ refers to changes in the amniotic epithelium, and Schmidt⁷ described an inflammation of the

amion which he believed was due to an extension from a cervicitis or deciduitis. Inflammatory changes may, however, readily develop after rupture. As has been stated, various factors may be responsible in different cases. The subject requires further investigation, for in the majority of cases, with our present knowledge, the cause of premature rupture cannot be determined.

Frequency.—Dry labor is generally believed to occur in about 10 per cent of cases. In my experience, this figure is too high. Among the ward cases in the Hospital of the University of Pennsylvania during the last three years dry labor occurred in about 7 per cent of deliveries, and

ADVANCEMENT OF PREGNANCY AT THE TIME OF RUPTURE OF THE MEMBRANES

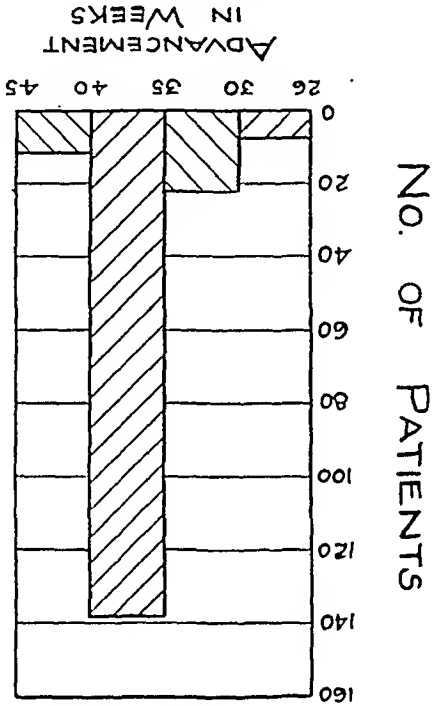


Fig. 4.—Of 180 cases of spontaneous rupture 30, or 17 per cent, occurred between the twenty-sixth and thirty-fifth weeks. While 138 or about 77 per cent took place between the thirty-sixth and fortieth weeks. In 16 cases the time of advancement was undetermined, or the rupture was due to trauma.

among my private patients it occurred in only 5.3 per cent. An interesting unanswered question is why labor usually develops so soon after rupture of the membranes. Degeneration of the decidua, increase of the amount of carbon dioxide in the maternal blood, excessive distention of the uterus, the influence of various endocrinal substances, pressure of the presenting parts, and traumas are some of the factors that have been suggested as causing the onset of normal labor. The endocrinal theory, plus local irritation resulting from pressure, is perhaps the theory most generally accepted. Premature rupture of the membranes, by permitting the presenting part to exert direct pressure upon the

internal os, probably accounts for the fact that labor sets in soon after this accident. The draining off of the liquor amnii alters the shape and size of the uterus, and the intermittent uterine contractions force the presenting part directly against the internal os; this, plus gravity, if the patient is in the upright position, probably results in sufficient irritation to stimulate further and stronger uterine contractions. It is a well-known fact that if uterine contractions become well established, there is a tendency for the pains to continue until the uterus has emptied itself, regardless of the stage of the pregnancy.

Meyer-Ruege⁸ collected 15 cases from the literature in which pregnancy continued for some months after rupture of the membranes, and DeLee, Coston,⁹ and others have recorded similar instances.

Diagnosis.—In true premature rupture of the membranes at or near term the diagnosis is usually made without difficulty. A history of the escape of the liquor amnii, which may occur in the form of a gush

INTERVAL BETWEEN RUPTURE OF THE MEMBRANES AND THE ONSET OF LABOR
(180 PATIENTS)

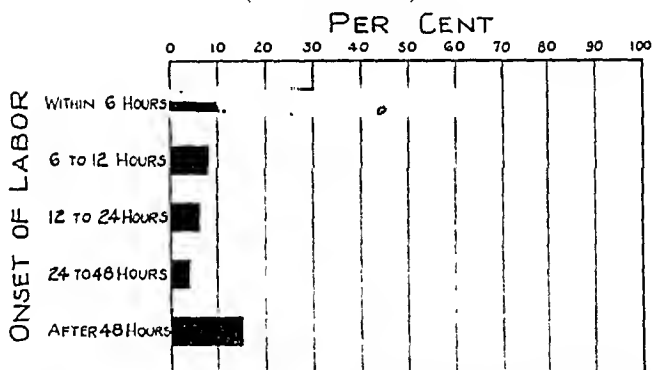


Fig. 5.—Of these 180 patients, 34 fell in labor immediately upon rupture of the membranes, and in 12 cases labor did not begin until sixty or more hours after this event. There were 16 case data not available upon this point.

of fluid or as a slow draining off of the waters, is, as a rule, obtainable, and, indeed, this information is generally volunteered by the patient or her nurse. The rupture may follow a blow or other trauma, or may develop without apparent cause. The history, taken in conjunction with the slight diminution in the size and alteration in the shape and consistency of the uterus, coupled with the fact that labor usually develops within a short time, is presumptive evidence that premature rupture of the membranes has occurred. If necessary, a vaginal examination may be performed to confirm the diagnosis. In an otherwise normal case, in which the pelvic measurements are known to be normal, it is best to omit the vaginal examination. If the occasion demands, a rectal examination is safer; if, however, this is not satisfactory, a vaginal examination, made under strict aseptic technique, may be undertaken. It is rarely necessary to make an intracervical examination. It is needless to state that a simple vaginal examination is less

likely to be followed by infection than is one in which the cervix has been entered. Patients in whom premature rupture of the membranes occurs are more prone to develop infection than are those in whom normal labor has taken place. Patients often believe that premature rupture has occurred, and this is subsequently found to be incorrect. Involuntary evacuation of the bladder may lead the patient to mistake the urinary flow for the discharge of amniotic fluid. Occasionally, also the rupture of the membranes occurs high up, and although some of the liquor amni escapes, sufficient remains to facilitate labor. The so-called ball-valve action of the head in cephalic presentation often serves to retain at least a portion of the liquor amni, but in these cases the head fills out the cervix less completely and less accurately than normally. As has been stated, in some cases only the chorion gives way and the amnion may remain intact. In my experience, supposed premature rupture of the membranes is more frequent than its actual occurrence.

When the function of the membranes and amniotic fluid is considered, the disadvantages of premature rupture can readily be understood. Thus the gentle and even dilatation of the cervical canal is absent, and with each uterine contraction the presenting part is forced directly against the cervical opening. This causes more severe pain and increased friction of the child against the uterine walls and cervical tissues, and tends to prolong labor. Not infrequently the cervix does not dilate properly and rotation may be arrested, or it may be effected less smoothly than under normal conditions. The cervix often becomes markedly edematous. The uterine walls exert their pressure directly on the irregularities of the child, and constriction rings are prone to develop. As a result of these conditions, and of the prolonged and unduly painful labor and ineffectual pains, the patient often becomes exhausted, discouraged, and highly nervous, and uterine atony is likely to ensue. The fetus may suffer from compression, and this is especially the case in cephalic presentations, and difficulty in delivering the aftercoming head is likely to occur when breech presentations are present. Failure of rotation to take place may result in other forms of dystocia. Since frequent vaginal examinations may be necessary, and operative deliveries are more commonly required in these cases, than in normal ones, the danger of infection is distinctly increased. The amniotic cavity may be infected in the early stage of labor, or even before its onset. That this danger is not merely theoretic has been demonstrated by Wamkeros,¹⁰ who found that a temporary maternal bacteremia occurs in many cases; fortunately, however, this is usually of a mild type. Hellenbach¹¹ believed that the child became infected by swallowing contaminated amniotic fluid. Siemens,¹² however, showed that the microorganisms penetrated the amnion, and

demonstrated their presenee beneath the amniotic epithelium covering the plaecenta. From this point they were seen to invade the large vessels and gain access to the fetal circulation. Slemons gave to this condition the name of "placental bacteriemia," and he believes that it explains the infections from which some of these ehildren die either before delivery or oftener within a few days following. DeLee also asserts that intrauterine infection accounts for the death of some of the children born during dry labor. As a result of these and other conditions, premature rupture of the membranes exposes both mother and ehild to increased hazards, and the morbidity and mortality of both are increased. It is also evident that premature rupture of the membranes is more serious for primiparae than for those in whom the birth canal has been dilated by previous labor.

Treatment.—Little beyond observing the ordinary care that should be accorded all pregnant women can be done to prevent premature rupture. It includes the avoidance of trauma, straining, and heavy lift-

TABLE III. TREATMENT

METHOD OF DELIVERY	NUMBER OF PATIENTS	PER CENT
Spontaneous	106	54
Foreeps { High 8 Mid 30 Low 34 }	72	37
Cesarean section	8	4
Version	10	5
54 per cent delivered spontaneously		
37 per cent delivered by foreeps operation		
9 per cent delivered by version or section		

ing, of purgatives, and of anything that is likely to stimulate uterine contractions. It is hardly necessary in this day to stress the importance of being gentle in making vaginal examinations. After rupture has presumably oecurred, and before labor sets in, the treatment is, for a time, at least, essentially expectant. It should consist of rest in bed, and guarding the patient against infection. A sterile vulvar pad should be worn, and coitus, vaginal douches, and vaginal examinations should be interdicted. If, at the end of twenty-four hours, labor has not begun, a therapeutie induction is usually indiated. In these cases I often employ the Watson method. Quinine and eastor oil are generally effective. Gellhorn and others have recorded untoward effects following the use of quinine. These have not been observed in any of my cases. Because of the special danger of infection to which these patients are subject, it is preferable, whenever possible, to avoid all vaginal examination. If the therapeutie method fails, a rectal tube or colpeurynter may be employed under strict aseptic precautions. In my hands the rectal tube has been more satisfactory than the colpeurynter. In 1902 Bauer (quoted by DeLee), and three years later

Stowe (quoted by DeLee), devised siphonurymeters that held channels through which the missing amniotic fluid could be replaced by sterile salt solution.

Operative procedures should be undertaken only in the presence of definite indications, such as extreme exhaustion and obstetric complications. When indicated, manual dilatation, preferably by the Harris method, may be employed. After labor has begun definitely the physician must be guided by the conditions as they arise in the individual case. If the labor proceeds favorably and the case is otherwise a normal one, it is often possible to effect a spontaneous delivery without the necessity of making a vaginal examination. On the other hand, the progress of the labor must be watched carefully, the acouneur bearing in mind that compression of the child may result in asphyxia or even in intracranial hemorrhage. These complications are especially prone to develop when the labor is complicated further by a malpresentation or a contracted pelvis. For these reasons, a partien-

(CONDITION ON ADMISSION
(196 PATIENTS)

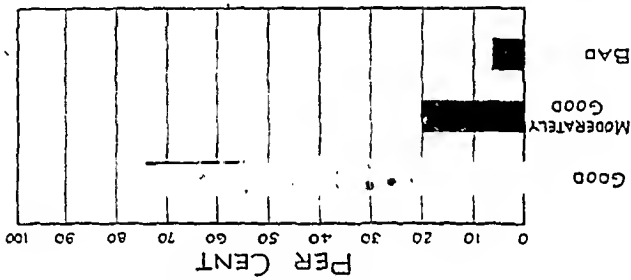


Fig. 6.

larly careful watch must be kept upon the fetal heart sounds. If the patient becomes exhausted, the administration of a sedative, such as morphine or chloral, will often provide sufficient rest to enable her to complete the delivery spontaneously, or at least to permit labor to progress to such a point that delivery may be effected by a low forceps operation. So satisfactory a result is not always obtainable, and it may become urgent at any time, in the interest of either the mother or the child, to resort to operative intervention. If rotation is arrested, it may become necessary to effect this, under deep anesthesia, with the aid of the forceps, and, after the head has been drawn into the pelvis, delivery may be permitted to proceed normally or be completed by making traction, as seems best in the individual case. In this connection it may be well to stress the danger of inducing injury on the soft parts, or even on the child, if delivery through an undilated birth canal is attempted. In a few instances, under certain conditions, as in elderly primiparae, I have performed version. Cesarean section may occasionally be justifiable. In extreme cases, where the child is

small and viable, vaginal hysterotomy may be the procedure of choice. Uterine atony may call for pituitrin, but this is rarely indicated, and should never be employed when there is any doubt as to the question of disproportion. The administration of pituitrin may result in uterine rupture. If the uterine contractions threaten to become tetanic, a general anesthetic should be administered. It is well to remember that, in general, abnormalities in contractures are, as a rule, associated

TABLE IV. POSTPARTUM MORTALITY AND MORBIDITY (MATERNAL)*
(Mortality, none)

COMPLICATIONS	CASES	PER CENT
Genital tract infection	32	16
Pyelitis	4	2
Postpartum hemorrhage	4	2
Retained secundines	4	2
Mastitis	2	1
Enteritis	2	1
Total	48	

*Average stay in hospital 17.2 days.

TABLE V. DURATION OF LABOR IN 106 CASES OF SPONTANEOUS DELIVERY

	HOURS	MINUTES
Average duration of labor	11	37
Shortest labor		45
Longest labor	70	
Nearly 50 per cent delivered in six hours or less		
About 75 per cent delivered in twelve hours or less		

with imperfect dilatation of the cervix and often with disproportion. Owing to prolonged labor and other factors, postpartum hemorrhage is more common in dry than in normal labor, and special precautions to prevent this accident should be adopted, including the postpartum use of ergot. DeLee wisely emphasizes the importance of guarding against the retention of the secundines, since a slight postpartum rise of temperature is not rare, and one should be secure on this point. In cases of dry labor it is difficult to predict the duration of the first stage, which is governed by so many factors. At the risk of repetition the statement will be reiterated that the treatment of dry labor

TABLE VI. INFANT MORTALITY (ALL CAUSES)

	PER CENT
Including prematurity and stillbirths	17
Excluding those dead upon admission	13

TABLE VII. INFANT MORTALITY (AT TERM)

	PER CENT
Alive on admission, but died either during delivery or before leaving hospital	5.5
Dead on admission	0.0

should be essentially conservative, and that operative delivery should be reserved for those cases in which it is especially indicated. Complications are more frequent than in normal cases, and these should be carefully guarded against, and met by appropriate treatment as they arise. A dry labor is essentially a complicated labor, and can be treated most advantageously in a well-equipped maternity hospital.

TABLE VIII. INFANT MORTALITY (PERMILLS)

PER CENT	
7.5	Alive on admission, but died either during delivery or before leaving hospital
4.0	Dead on admission

TABLE IX. CAUSES OF INFANT MORTALITY

NUMBER OF CASES	
8	Deaths on admission (cause undetermined)
7	Intracranial hemorrhage
6	Asphyxia
5	Asphyxia with knotted cord
4	Prematurity
4	Disproportion
2	Congenital cardiac lesion
1	Extraction, neck broken
34	Total

The accompanying tables and diagrams show an analysis of a series of dry labors about two-thirds of which are from ward and the remainder from private practice. Only cases of complete dry labor have been included and by that is meant that practically all the liquor amnii has escaped either during the first hour or two of the first stage of labor or prior to its onset. The series thus studied comprises 196 cases. The results are based upon the patients' stay in the hospital

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THE CORPUS LUTEUM AND THE MENSTRUAL CYCLE TOGETHER WITH THE CORRELATION BETWEEN MENSTRUATION AND IMPLANTATION*

BY CARL G. HARTMAN, PH.D., BALTIMORE, MD.

(From the Department of Embryology, Carnegie Institution of Washington)

IT IS my desire to call attention to several problems whose further study seems likely to yield new facts underlying the cause of menstruation, in which it may be admitted we have advanced very little since Aristotle. My general thesis is that ovulation and the formation of the corpus luteum are unessential for menstruation. I may state at the outset, however, that it is only with respect to this phase of the question that I find fault with the prevailing opinion.

THE SEXUAL RHYTHM IN MAN AND OTHER MAMMALS COMPARED

Let us first consider homologous phases of the sexual cycle in man and the lower mammals. We can do this most expeditiously by referring to Fig. 1. Let Column *O* represent the act of ovulation, except for lines 7 to 11, in which cycles are thought of as occurring without ovulation. Lines 1 to 6 represent nonpregnant cycles; lines 12 to 17, pregnancies. Uterine bleeding, the essential feature of menstruation and implantation, is represented, more or less according to intensity of flow, by black areas or lines. A considerable series of animals is included, for it is time to admit that not only do we have human reproductive processes pretty accurately mirrored in the monkey, but that these processes are really adumbrated in the lower mammals. It is by experimental studies in the monkey that the menstruation problem will finally be solved; but lower forms may also do their bit by showing what is essential and what is superficial; for what is phylogenetically significant is apt to be physiologically fundamental, and what is species specific often amounts merely to an accidental cenogenetic variation imposed as an adaptation to certain limiting conditions.

Let us begin at the cycle with which you as gynecologists are thoroughly familiar, the human (line 6). The sequence of events is as follows: near the midinterval between two menstrual periods ovulation usually takes place, the graafian follicle becomes the corpus luteum and within two days assumes additional duties as an inertory organ. While it develops, the endometrium, already greatly thickened, vascular, and succulent at the time of ovulation, undergoes those changes in glands, epithelium, and stroma characteristic of the premenstrual (pregnoid) condition. The egg dies, the corpus luteum involutes and

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in due course of time, more or less predictable in each case, hemorrhages take place in the subepithelial region, the functionalis is sloughed off and menstruation takes place.

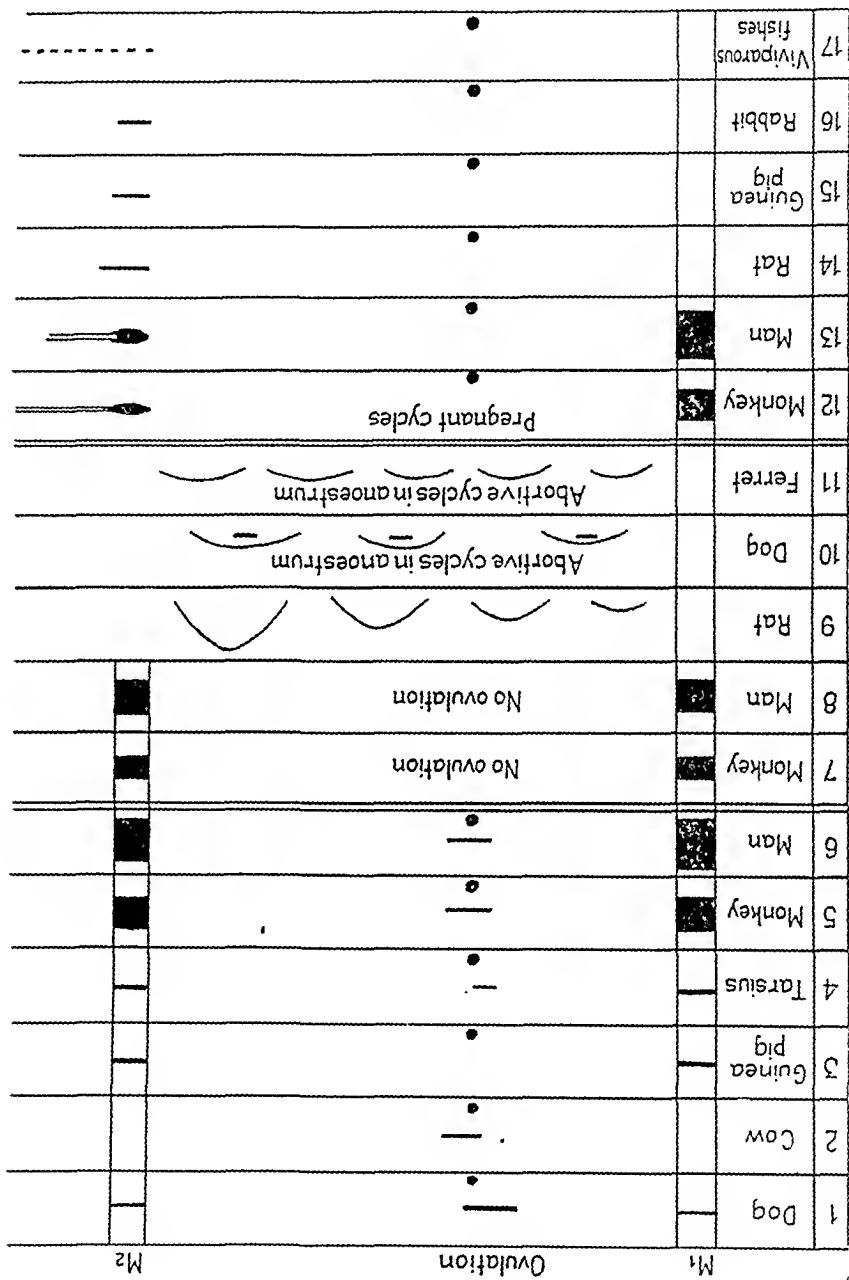


FIG. 1.—Homologous events in the sexual cycle of animals. Details explained in the text.

That this is the usual sequence of events in the human female the year round is proved by a sufficient series of observations. Unfortunately, however, too many cases that differ from this are dismissed as pathologic, that convenient pot pourri which receives everything that

fails to agree with preconceived notions. What could we not learn of normal physiology by salvage from this heap! We may recall that only a few years have passed since Hitschmann and Adler rescued the "premenstrual endometrium" from the category of the pathologic, where it had the cognomen "endometritis." More such reprieves are in store for us.

In the monkey there is the same sequence of events (line 5). As a menstruating organism, the human female no longer stands alone, as we have known since Cuvier and, more definitely, from the work of Heape, van Herwerden, Halban, Corner, Allen and Joachimovits. Into the details of these works this is, however, not the place to enter.

Furthermore, the metestrous bleeding in the guinea pig (Stockard and Papanicolaou), the lemur *Tarsius* (van Herwerden), and others (lines 3 and 4 of Fig. 1) show that the menstrual process has been foreshadowed in the lower forms.

The time relation of ovulation (when it occurs) to menstruation being established, we are no longer troubled about the uterine bleeding in the dog, as were the gynecologists of the last century. For the bitch also has periodic bleeding, visible externally and still misnamed "menstruation." That this designation is entirely erroneous is shown by its time relation to ovulation; it precedes and accompanies ovulation, hence the correct term, "proestrous bleeding" (line 1). A similar and quite homologous bleeding occurs at the cotyledons of the cow (line 2). The final proof of the homology just expressed is, I think, the discovery of the intermenstrual bleeding in the monkey, which very frequently occurs in the middle of the menstrual cycle (line 5). It is usually microscopic, always less than in the dog, and is in both species a concomitant of the congestion accompanying the presence of a maturing follicle. It is probable that the "Mittelschmerz" and its frequently attendant hemorrhage is the pathologically accentuated expression of the same process in the human. Perhaps future study will elevate the intermenstrual bleeding in the human female from the rubric "pathologic" to the physiologic and the normal.

MENSTRUATION WITHOUT OVULATION

It must be conceded that the preceding sequence of events, which includes ovulation in the cycle, is the usual one in the human female and in the monkey during the breeding season. Yet ever since Bischoff, Coste, Ritchie, Duval, Leopold, and others, human cases have been cited in which menstruation was found to have taken place with no sign of a corpus luteum in the ovary. These are all termed "pathologic" by most authors of the day. This is a matter for gynecologists to settle for the human species. Let me present the findings in the monkey.

Heape in 1891 spent four months in India and collected many men-
struating uteri of *Semnopithecus* and *Aliaeus* thesus; very few of
these were accompanied by corpora lutea. Van Herwerden made an
analysis of 87 uteri of the Java macaque (*Cercocebus*) collected on
Banka Island. She distinguished two classes of uteri: (A) those with
narrow mucosa, resting glands, poorly developed arterioles. In none
of these cases was there a corpus luteum; (B) uteri with swollen mu-
cosa, secreting glands, thick-walled arterioles, all associated with cor-
pora lutea. On the basis of these anatomic studies the author
postulated a breeding season, in which the sexual cycle is character-
ized by ovulation, the pregravid endometrium, and a possibility of
conception and implantation. These are timed for parturition in the
dry season. Alternating with this is a nonbreeding season in which
menstruation continues without ovulation. Cycles without corpora
lutea have been described by Corner in his fundamental contributions
to the subject from 1923 on, as well as by Edgar Allen, and more re-
cently by Joachimovits. Menstruation without ovulation is always from
uteri of the interval type; but the point is, it is a periodic uterine
bleeding with loss of endometrial tissue, which constitutes mensura-
tion. To say this is "pathologic bleeding" has not advanced our
knowledge of what causes it to be periodic; to call it "pseudomenstru-
ation," as R. Schroeder suggests, I am unwilling, inasmuch as I hold
the causative agent the same in the presence or absence of ovulation.

A NONBREEDING SEASON IN THE MONKEY

The findings of van Herwerden referred to above is of the greatest
theoretical interest. If it is true that for a whole season menstruation
may go on as regularly as ever, then we must figure on the possibility
that the physiology of the process will be worked out on the basis that
ovulation is not essential, or in other words, the corpus luteum has
nothing to do with it. In view of the importance of the problem it is,
therefore, not without interest that van Herwerden's interpretation of
her material is confirmed in the Carnegie Colony of *Aliaeus* thesus in
that, in our animals in captivity, there is also a breeding and a non-
breeding season, which correspond to a nicely with the keen deduc-
tions of van Herwerden on monkeys killed in the wild.

Even the time of year corresponds. The breeding season in our
colony extends from September to April. Of nineteen pregnancies
coming to pass within the last two years (fourteen the past year), one
conception occurred in September, two in January, two in March, one
in April, the others all in October (2), November (7), and December
(4). The time of the year agrees with the optimum period of concep-
tion for 37 births to the credit of the monkey colonies in the National
Zoological Park from 1905 to 1925. The nonbreeding season corre-
sponds with the time of year in which Heape visited India and explains

the paucity of corpora lutea encountered by him. In our colony many laparotomies were done, chiefly throughout the winter months. Some animals were found to ovulate with great regularity, although certain others, just as regular in menstruation, passed whole periods without follicular growth, to say nothing of ovulation. During the summer, twelve laparotomies were performed to explore the ovaries, in most cases on animals known to have ovulated in the winter. In eleven out of the twelve cases the ovaries were "empty," that is, without a sign of a graafian follicle or corpus luteum. The single exception had a large, slightly atretic follicle which was beyond capacity for growth and rupture. Allen opened two females in July; both of which had medium sized atretic follicles.

As is theoretically to be expected, the intermenstrual bleeding is also practically absent during the summer months. Animals are more irregular, sometimes quite amenorrhoeic, occasionally sick in the summer. Yet most of them go on menstruating with remarkable regularity as to interval, duration, and intensity of flow.

Let us, then, face the fact that uterine bleeding may take place periodically in the monkey but that without an inspection of the ovaries it is impossible to tell which type obtains in any case. Indeed we may concede that for a whole season menstruation may continue without ovulation. The corpus luteum is, therefore, not essential for the menstrual process; it is quite possible that, while the ovary is necessary, the corpus luteum has nothing to do, directly or indirectly, with the monthly flow (lines 7 and 8 of Fig. 1).

Cycles without ovulation, more or less abortive, are not unknown for lower mammals. The adolescent rat approaches the first "heat" period by a series of abortive cycles in a kind of crescendo toward complete estrus. The same is true after lactation. In the dog, Papanicolaou finds abortive cycles, with *bleeding*, during the anestrus or so-called "rest period"; and a similar finding was reported by Marshall for the ferret (lines 9, 10, 11).

There are, of course, certain stubborn facts that will need a new explanation. Thus, for example, ovariectomy or removal of the corpora lutea at any time after the middle of the cycle, results two to six days later in menstruation. Is not, therefore, removal of the corpus luteum the cause of menstruation? It would be disastrous to the prevailing gynecologic opinion to acknowledge as much, for to do so would be equivalent to conceding that menstruation may take place from an unprepared endometrium. E. Allen was able to produce uterine bleeding by injection of the female sex hormone in castrated monkeys. Upon removal of ovaries containing follicles, or removal of the follicles only, Allen produced uterine hemorrhages three to six days after the operation. I have also four times brought on such bleeding five to seven days after removal of, or even merely opening a large

atretic follicle. Once the experiment of opening the follicle failed, probably through healing and resumption of hyperaetivity (as deduced from excessive vaginal desquamation). That the effect of such injuries is a direct one is by no means proved; that its effect may obtain through a more complex mechanism causing uterine bleeding seems entirely reasonable.

The function of the corpus luteum in pregnancy is another story. It does more than produce the "decidual reaction" of Loeb, which is of some importance to that small minority of mammalian orders having a decida. The corpus luteum is necessary for gestation in the cow that has no decidual tissue; it is necessary, as I found, in the opossum, in which species there is not even a placenta! The corpus luteum has been made responsible for preventing the menstrual flow during pregnancy; yet ovariectomy at this time has not resulted in the resumption of menstruation. In any event, the corpus luteum in man begins to degenerate with the sixth month or sooner. Furthermore, lactation of itself is sufficient to prevent the menstrual flow even in the absence of corpora lutea.

THE CORPUS LUTEUM AND THE PREGRAVID ENDOMETRIUM

That the pregravid condition of the endometrium is due to the corpus luteum is a reasonable deduction from observations on man and monkey and from well-controlled experimental work on the rabbit. A significant number of observations on primates have now been made to warrant the statement that the pregravid endometrium is associated with a corpus luteum in the ovary. This association being established, it is but natural to conclude that one is cause, the other effect. The argument is a good one but cannot, of course, take the place of direct experimentation. Perhaps we might lay down certain criteria, some-what after Koeh's laws, for the validity of endocrine cause and effect, as for example the following:

1. A certain effect must always be associated with a given condition of the endocrine gland. Example: the corpus luteum has always been found associated with the pregravid endometrium.

2. Absence or removal of the gland must preclude the effect. Examples: In monkeys the interval endometrium only is found in nonovulatory cycles. The "removal" experiment has not been done in primates. But in rabbits we have the beautiful experiment of Aneel and Bouin, corroborated with complete controls by Corner, showing that removal of the corpora lutea eliminates the "luteal phase" or the pseudopregnant growth of the uterus.

3. Transplantation or substitution by extracts of the gland, must replace the normal action of the gland. Examples: Corner and Williams Allen were able with luteal extracts to bring about pseudopregnancy in mated rabbits after ablation of the corpora lutea. Halban

proved by transplantation that the ovary of monkeys is necessary for menstruation. E. Allen was able to produce uterine bleeding, *but no pregravid endometrium*, with the female sex hormone in castrated monkeys.

4. *Removal of transplant or cessation of administration of extract must be equivalent to (1)*. When Halban removed the ovarian transplant, menstruation in his monkeys ceased.

The works quoted in the rabbit, and in a negative way in the monkey, offer experimental evidence of corpus luteum influence on the uterus. The trend of evidence is in favor of the assumption that the corpus luteum produces the pregravid condition of the endometrium but the direct proof in man and monkey is still lacking.

MENSTRUATION AND IMPLANTATION

It is proposed in this section to offer some suggestions which may possibly help approach the menstruation problem closer, inasmuch as my criticism has thus far been mostly of a destructive nature.

I wish first to draw attention to the following correlation, which may have considerable significance: Human beings, the apes, and the old world monkeys, are the only animals which menstruate, in the strict sense of that term. Now these are the only forms having a peculiarly hemorrhagic type of implantation. Consider the condition in the human being. In the youngest stage of human development yet discovered, the Miller ovum (Streeter) imbedded just below the uterine epithelium, the trophoblast on all sides is just beginning to tap the blood vessels, but extravasations are minimal. The Kleinhans and the Bryce-Teacher 1 and 2, but slightly older, are, on the other hand, completely surrounded by lacunae of extravasated blood. In later stages, as the ovum bulges into the uterine cavity, the lakes of blood occupy large regions under the ovum, as in the monkey from the beginning. These lakes of blood caused by the erosive action of the trophoblast (and for some distance beyond its actual contact with the tissues) are apparent in all of the classical descriptions of early human ova. A series collected by Dr. George L. Streeter, Director of this Laboratory, makes a striking exhibit when viewed from this new standpoint. In a twenty-nine day implantation of *Macacus rhesus* we find the dilated uterine glands under the implantation sites gorged with blood. Some of this passes into the much reduced lumen of the uterus, reaches the vagina and constitutes the "placental sign" or as Dr. Streeter suggests it should be called, the "trophoblastic sign" (lines 12 and 13 of Fig. 1).

What significance is to be assigned to this parallelism between the hemorrhage of menstruation and that of implantation it is not possible to say without much further study. It is instructive to note for the present that nature has reserved both to the higher primates. This is

a hint which we should follow. We must ascertain by histologic and experimental study what the two processes have in common, for example, as to endothelial destruction, extravasation, loss of tissue and their cause or causes. Perhaps causes outside the ovary or uterus operate with those organs in both processes. It is significant that in early pregnancy the hemorrhage is not always confined to the implantation site and, conversely, it is equally significant that in some menstruation takes place first and more intensely at the future implantation sites which are already marked out in the virgin uterus. Let us pursue the matter phylogenetically. It was noted above that the lower mammals hazily foreshadow the menstrual process in the metoestrous hemorrhages or the slight bleedings following pseudopregnancy. In like manner we find hemorrhages into the uterine cavity or even into the decidua, as is well known for the rat (Long and Evans); this holds also, as I am informed by my colleague, Dr. Wislocki, for the guinea pig and rabbit as well. Those who have read the contributions of Bonnet and of Kolster on the constitution of embryotrophic material in the pregnant uterus know how universal, even in the nondeciduates, is the admixture of red blood cells.

We need, however, not confine ourselves to the mammals. "The one increasing purpose" runs through the whole geologic epochs before the advent of mammals; the viviparous fishes, and perhaps also viviparous amphibia and placental lizards, have a story to tell concerning the behavior of red blood cells and the capillary endothelium during embryonic nutrition. The facts are inadequately known and the studies scattered and isolated. It is clear, however, (though authors usually mention the fact more or less casually), that red blood cells filter into the lumen of the brood chamber, whether this be a dilated portion of the oviduct, the ovarian cavity or even the ovarian follicle modified for the purpose, it may even be the pouch of the male into which the female places the eggs (Hippocampidae), as Kolster has shown. Everywhere the same story: red blood cells in the brood chamber. Associated with this process one finds degeneration of endothelium, a process favoring the leakage of free blood into the pregnant organ. What is the meaning of this process so intimately connected with intruterine gestation? The pathologist becomes alarmed at bleedings into any other cavity in the body. He looks for red blood cells in the urine, in the cerebrospinal fluid, in sputum; he makes tests for occult blood in the feces and bases his diagnosis on his findings. But bleedings into the uterine cavity during implantation has a long history. It is a physiologic process. So is menstruation. They must in some way be connected. They have points in common. What is the underlying cause?

The correlation of the menstrual bleeding with the bleeding of implantation as exhibited in the higher primates; and the further wide-

spread association of uterine bleeding with reproduction throughout the vertebrate phylum (except perhaps the birds), leads us to suggest:

1. That we look for an *active* cause of the menstrual process.
2. That (specifically) we abandon the theory of the degeneration or absence of the corpus luteum as the causative factor of the menstrual flow.
3. That the causative factor be sought outside the ovary, though co-operating with this organ in the maintenance of the menstrual rhythm.
4. That the hemorrhages of menstruation and implantation be studied as homologous processes to determine their common denominator, for it is more than an accident that menstruating forms should have a peculiarly hemorrhagic type of implantation.
5. That we go beyond the primate series to the lower vertebrates, even to the cartilaginous fishes, wherever, indeed, free blood is passed into the brood chamber of the pregnant female, in order to glean hints as to the meaning of the periodic loss of blood into the womb of woman.

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In addition to the cases just mentioned, there appear eight references to an epithelial neoplasm involving the cervix or body of the uterus. In this connection, Kermanner calls attention to the fact that carcinoma of the uterus rarely occurs before the twenty-second year, and questions whether neoplasms of the uterus encountered in child-

of the struma. carcinoma which had invaded the lymph vessels and the interstices cervical lip. Microscopically, the growth proved to be an adenocolor. It extended from the anterior wall of the vagina to the anterior Society was the size of a hazelnut, fissured, and grayish-yellow in by Aschheim at a meeting of the Berlin Obstetrical and Gynecological ing, and died several weeks later of pyelitis. The tumor demonstrated operated upon by Bumm six months after the onset of vaginal bleeding. The vaginal neoplasm occurred in a child of eight months, who was origimate in the clitoris.

of the vulval neoplasm with the comment that the growth was said to been unable to consult the original article, I shall pass over the case In two instances an epithelial growth of the external genitals has been reported, one of the vulva and one of the vagina. Since I have analysis which I shall present for your consideration.

lesions will, I hope, justify the rather detailed clinical and pathologic clearly to have been a carcinoma. The grave importance of these There is, however, a small group of cases in which the neoplasm seems regarded as a carcinoma, the accuracy of the diagnosis is debatable. able information; in other instances in which the lesion has been re- would wish. Occasionally this deficiency depends upon a lack of avail- decades, it is not surprising that some are less satisfactory than one although since these have appeared at intervals during the past four as possible, the original articles in the literature have been consulted, neoplasm which we believe should be classified as a carcinoma. As far clinical and pathologic findings in a girl of ten years with an uterine plasma, to review the cases reported in the literature, and to add the the purpose of the present paper to deal with the latter type of neo- usually sarcomatous in character. Neoplasms of an epithelial origin affecting these organs are even less frequently encountered. It is are relatively uncommon in childhood, and when present are **M**ALIGNANT lesions involving the vulva, vagina, uterus, or ovary

(From the Woman's Clinic, Yale School of Medicine)

BY ARTHUR H. MORSE, M.D., NEW HAVEN, CONN.

CARCINOMA OF THE FEMALE GENITAL TRACT IN CHILDHOOD

hood are truly carcinomatous in character. He points to the wolffian duct as a possible source of origin of such newgrowths, and suggests that a more careful study might lead to their classification as mixed tumors of congenital origin.

With a similar thought in mind, and in order to simplify the description, I have arbitrarily divided these eight cases into two groups. In the first group, I include those of von Rosenstein, Rössle and Adams, in which the diagnosis of carcinoma is open to question, and those of Beljajéva and Aguinaga, concerning which the available information is scanty.

The contribution by von Rosenstein, which appeared in 1883, concerns a child two years of age. For three weeks previous to examination, there had been transitory pains upon urination and for eight days a slight elevation of temperature. Arising from the pelvis and extending three fingerbreadths above the umbilicus, was a tumor with an irregular surface, which was painful upon palpation and over which the percussion note was dull. The right and left inguinal glands were enlarged. Up to the time of death, which occurred fourteen days after admission, there was urinary retention, although there were no symptoms referable to the intestine. The autopsy revealed neoplastic masses extending outward from the right and from the left cornua. The latter mass was somewhat smaller, with a softened central portion. The infravaginal cervix and the endometrium throughout were intact.

A microscopic examination of the neoplasm showed a varying histologic structure. At some points, lying in a fine alveolar stroma between the muscle fibers, were nests of epithelial-like polymorphous cells, which varied in size and contained from one to several nuclei. At other points, closely packed together in a scanty fibrillar stroma, were spindle cells, having the appearance of sarcomatous elements. Although the diagnosis of carcinosarcoma was made, the neoplasm was thought by other authorities to be a spindle cell sarcoma, which in places presented an alveolar structure.

In Rössle's patient, ten years of age, the uterus was replaced by a tumor the size of a child's head, which filled the true pelvis. Because of adhesions, the exact point of origin was undetermined. Upon the peritoneum, pleura, and diaphragm were metastatic nodules occasionally 4 cm. in thickness, and in some instances presenting areas of softening. In the primary tumor were numerous cystic cavities and calcified and hemorrhagic nodules. The consistency and appearance of the cut surface simulated that of a carcinoma of the ovary. Microscopic examination disclosed spongy collections of undifferentiated embryonal cells, wholly different from the type of cell usually found in carcinoma of the uterus. These cells, however, suggested certain large cells of an ovarian carcinoma or those of the so-called interstitial cell sarcoma of the testicle.

Adams' patient, two and one-half years of age, had for three weeks before admission a discharge of blood from the vagina which increased progressively in amount and frequency. Although there was fullness of the abdomen, there was neither dysfunction of the bladder or of the rectum, nor complaint of pain.

The child was well nourished, in spite of the fact that fluid and clotted blood were escaping from the vagina. In the hypogastrum, situated between the bladder and the rectum, was a palpable tumor partly cystic in consistency.

At laparotomy, a rounded cystic growth the size of half a tennis ball occupied the retrocolic space. This neoplasm obscured the uterus but was obviously attached to the roof of the vagina. Upon incising the peritoneum over the tumor, a cystic hemorrhagic mass was found, but since it was densely adherent, only a portion was

excised. A few days after operation, there was profuse vaginal hemorrhage and urinary retention. The child gradually lost ground and died two months after operation.

Autopsy disclosed a large growth occupying the center of the pelvic cavity. The neoplasm was completely covered by peritoneum, adherent anteriorly to the bladder and posteriorly closely connected with the rectum. While there was no evidence of metastasis to any of the other abdominal organs, several enlarged glands were found in the mesentery and in the thorax and neck.

A sagittal section taken through the cervix and body of the uterus showed that the organ was largely occupied by a broken-down neoplasm made up of a network of supporting tissue and containing several hemorrhagic areas. Extension had taken place into Douglas' cul-de-sac and into the vagina. Tubular structures lined by columnar and cuboidal cells were demonstrable, although in the presence of degenerative changes the tubular structures were absent and the cells were grouped irregularly. The intervening connective tissue was minimal in amount. Ross regarded the neoplasm as a carcinoma arising in the glandular epithelium of the body of the uterus. This diagnosis was disputed by the Pathology Committee of the Royal Society, who, after a critical examination, advanced the opinion that the neoplasm was not a carcinoma of the uterus but rather, a teratoma.

Unfortunately, I have been unable to obtain the original articles by Beljaewa and by Agnaga. The first author, in 1913, reported the case of a child ten years of age who for two and one-half years presented a bloody vaginal discharge. Autopsy revealed tuberculosis of the lungs and bronchial glands and an epithelial neoplasm having its origin in the uterine glands. The second author, in 1926, reported a growth of similar character having its origin in the cervix.

I shall dismiss this group of cases with the comment that in the first three, those of von Rosenstein, Kössle and Adams, the diagnosis of carcinoma must be accepted with reservations, while in the cases of Beljaewa and Agnaga, an opinion regarding the character of the neoplasm must be withheld because the available information is incomplete.

Let us turn now to the second group of reports, in which are presented detailed clinical observations and careful studies of the pathology of the neoplasm. Here I shall consider in order the case of Ganghofer, reported in 1888, that of Glöckner, reported by Mergelsberg in 1913, and that of Kehrler and Neumann, reported in 1928.

Ganghofer's patient, an eighty-year-old girl, gave a history of vaginal bleeding which had been present over a period of two to three years. She had already suited a midwife who, in spite of the fact that the bleeding continued uninterruptedly and not at regular intervals, regarded the symptoms as due to a premature onset of menstruation.

Upon palpation of the abdomen, nothing unusual was discovered. A moderate quantity of bloody mucoid material flowed from the vagina. Palpation of the canal disclosed multiple soft prominences, which seemed to have their origin from the anterior vaginal wall, and which, viewed with a speculum, proved to be attached to a pale red, lobulated tumor. The neoplasm bled upon the slightest touch, and was so friable that a portion the size of a pea came away spontaneously. Further exploration of the vagina conveyed the impression that the neoplasm originated from the anterior vaginal wall and was a sarcoma.

Removal by the vaginal route was attempted, but since the canal was too narrow to permit the satisfactory use of a speculum, the perineum was incised. The tumor mass, which at its point of origin was about 2 cm. across, was brought away in pieces and the base cauterized. At a subsequent examination, it was demonstrated that the vaginal vault as well as the anterior vaginal wall was intact, and that the tumor mass rose exclusively from the infravaginal portion of the cervix. The patient died eleven days after operation from smallpox.

Sections of the neoplasm examined by Chiari presented the histologic structure of a medullary carcinoma. The framework of the tumor, made up of a delicate connective tissue stroma rich in blood vessels, contained relatively large reticular spaces, in which lay masses of closely approximated epithelial cells interspersed with polymorphonuclear leucocytes. In one corner of the section were large gland cavities, lined by a single layer of epithelium and filled with mucus. The lumina of other glands were partly or wholly obliterated by epithelium two or more layers in thickness, which passed directly over into solid cell columns filling the interstices of the stroma. The lymph glands of the pelvis were free from metastases.

The neoplasm was regarded as a medullary adenocarcinoma having its origin in the glands of the vaginal portion of the cervix.

Glöckner's case illustrates the fact that a malignant lesion of the female genital tract may, in childhood, escape recognition for a considerable period of time. At seven the patient came under observation because of a vaginal discharge which had existed since the fourth year of age. In the course of the examination parasites were discovered and accordingly douches of protargol and of vinegar were prescribed. Three weeks later there was an outspoken hemorrhage, succeeded in a few days by a blood-stained, watery discharge. A chamomile wash was then ordered, which gave no relief. Thirty-eight days subsequent to the first consultation, there was relatively profuse vaginal bleeding, as a result of which a rectal examination was made, which proved negative. A solution of sodium acetate was then ordered as a douche. Two hundred and ten days following the first visit, the child's mother brought to the hospital two pieces of tissue the size of hazelnuts, which had been expelled from the vagina. These were examined by Robert Meyer, and later by Carl Ruge, who after an exhaustive study, made the diagnosis of carcinoma. A pelvic examination at this time demonstrated the presence of a tumor in the vagina, and the patient was admitted to the Frauenklinik.

She was observed in the hospital for eight days, but at the termination of this period, she was removed by her parents. Following readmission, a pelvic examination under anesthesia revealed in the position of the infravaginal cervix a freely bleeding, friable tumor the size of a walnut. Since the uterus, together with the growth, was movable, a radical operation was advised.

Two hundred and fifty-four days subsequent to the first consultation, the uterus, adnexa, and the upper third of the vagina were extirpated. Except for a separation of the wound to the fascial layer, which required resuturing, the convalescence was uneventful.

A microscopic examination of sections from the specimen showed in addition to fundal glands lined by characteristically normal epithelium, glands in which the cylindrical epithelium was replaced by cubical, round, polymorphous cells. In some instances the gland lumen was almost obliterated as a result of epithelial proliferation, while in others there was an invasion of the basement membrane and the surrounding stroma associated with degeneration of the latter structure.

The neoplasm was regarded as a typical adenocarcinoma having its site of origin in the anterior cervical lip. It is noteworthy that the growth progressed so slowly, and that no metastases were present.

For three years following the operation, the patient's condition was remarkably satisfactory. However, examined four years subsequent to radical hysterectomy, metastases were demonstrated in glands excised from the right inguinal region. Rectal and vaginal examination failed, however, to reveal a recurrence of the growth in the pelvis. X-ray therapy appeared to have no effect upon the progress of the metastatic nodules. Information regarding the eventual outcome in this patient is lacking.

The most recent report is that of Kehler and Neumann and concerns a child sixteen months of age. She was brought to the clinic because of increasing pallor, a tumor in the lower abdomen, and bloody vaginal discharge which had been present for four weeks and which upon admission contained colon bacilli. The distended lower abdomen exhibited in the middle a firm, elastic mass, deviating slightly to the left, and at its highest point extending two fingerbreadths above the symphysis. The neoplasm almost completely filled the pelvic cavity, and although it was impossible to determine the type or the place of origin, the tumor was clearly malignant.

At laparotomy, a soft mass, somewhat larger than a hen's egg, and capped by the hyperemic, small, soft uterine fundus, was found arising from the depths of the pelvis. The lower pole of the mass extended downward to the pelvic floor and laterally to the pelvic walls. The ureters, above constricted portions corresponding accurately to the points where the ducts were crossed by the uterine vessels, were dilated almost to the size of the little finger. During its removal, the soft tumor separated, and necrotic purulent material, having the odor of *B. coli*, escaped through the opening. The child stood the operative procedure well, but in spite of the prophylactic administration of serum, died upon the tenth day after operation of a slowly developing peritonitis.

Sections from several areas of the tumor were examined microscopically. At some points, irregularly distributed throughout a cellular tissue whose elements consisted of well-stained round cells and large vesicular cells, were spindle-like elements, suggesting the histologic structure of a mixed cell sarcoma. In the same section, surrounded by tissue poor in cells and having the appearance of hyalinized smooth muscle, was a larger complex of tissue, whose elements consisted of young connective tissue and round cells. In this lay well-differentiated alveoli, containing cells which were larger than those of the surrounding tissue and which were without question epithelial in origin. The morphologic structure of the individual alveoli lacked uniformity. While some contained collections of large vesicular cells, others had the form of glands, still others were irregularly coiled. Many of the alveolar cavities were obliterated by the proliferation of the vesicular cells already mentioned. Any doubt as to the epithelial character of the latter elements was dispelled by the positive results of appropriate staining methods.

Extension of the lesion along the interstices of the myometrium, and invasion of the capillaries was demonstrable, but excepting the region of the internal os, neoplastic cells were absent from the cervix. Likewise, metastases were absent from the lymph glands removed from the pelvic cavity and from the vicinity of the aorta. Although fragments of the neoplasm had been forced into the lumen of the interstitial portion of the tube, no carcinoma cells were found in the isthmus portion.

Kehler and Neumann concluded that the neoplasm was a carcinoma whose nature cells showed a tendency to differentiate into structures varying morphologically. This opinion was confirmed by Verse and Robert Meyer.

CASE REPORT

Our patient, ten years of age, was admitted to the Yale Woman's Clinic July 7, 1928, with a diagnosis of gonorrheal vaginitis of two years' duration.

Two years before admission, the mother noticed that the child's bed was soiled by a discharge issuing from the vagina. Smears which were examined by the family physician were said to be positive for gram-negative intracellular diplococci. In spite of the administration of vaginal douches, the discharge persisted, upon two occasions being associated with blood.

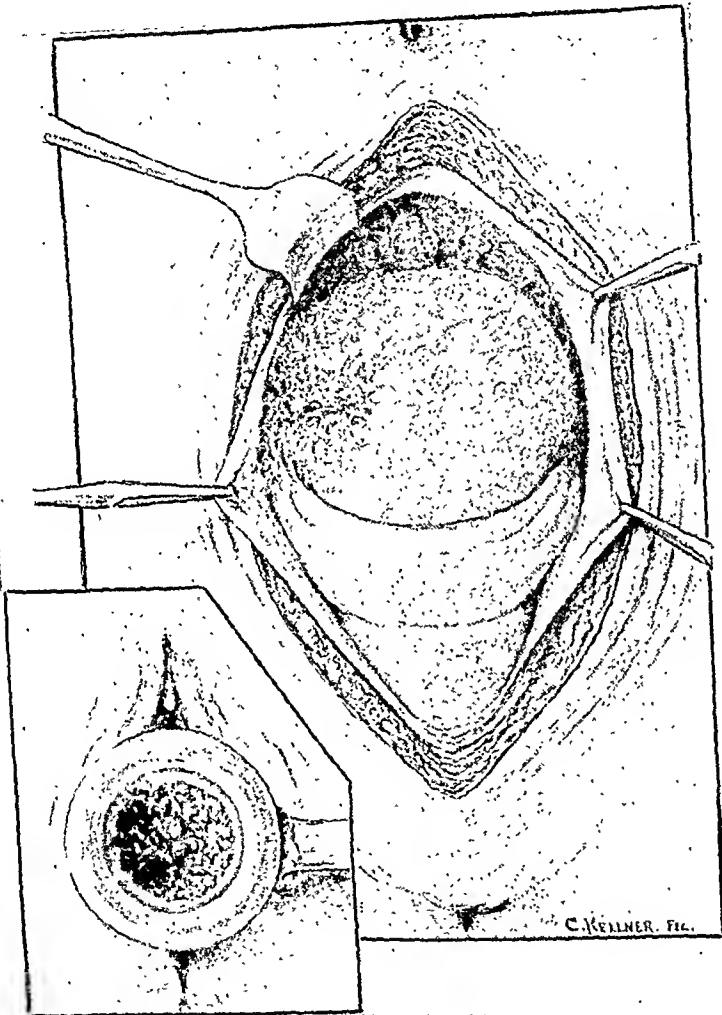


Fig. 1.—Appearance of uterus in pelvic cavity. Inset: appearance of cervix upon inspection.

During the three months previous to admission, the vaginal discharge became more profuse. There were, in addition, nocturia and increased frequency of urination, although the volume of urine passed at any one time never exceeded 100 c.c.

The child was well developed, but poorly nourished and irritable. Except for dental caries and chronic tonsillitis, examination of the head and chest was negative. The abdomen was distended, and the fundus of the bladder extended upward to the umbilicus. Palpation revealed tenderness in the suprapubic region and in the iliac fossae, but no pelvic mass was demonstrable. The labia minora and the urethral

orifice were red and swollen. Issuing from the vagina was a profuse, watery discharge, which was blood-stained and which occasionally contained bits of grayish-yellow, semisolid material. On the basis of these local findings, we made a tentative diagnosis of cystitis associated with an extensive gonorrhoeal vaginitis.

Rest in bed and vaginal irrigations of boric acid solution were instituted and continued for three weeks. Under this treatment, the patient's general appearance improved and there was a slight gain in weight and strength. The temperature curve ran an irregular course, and upon one day reached 39.6° C. The R.B.C. was 4,130,000, and W.B.C. varied between 14,000 and 24,000. Upon one occasion, the child passed a hard stool containing partially changed blood.

While the patient's general condition remained unchanged, the vaginal discharge persisted, in spite of irrigations. Our suspicions, however, were first aroused by the continued presence in the discharge of the grayish-yellow material mentioned above,



Fig. 2.—Vaginal epithelium beneath which the epithelial cells in cord-like structures.

which proved to be bits of necrotic tissue. A vaginal examination was then imperative, and under gas and oxygen, a small sized endoscope was introduced through the hymeneal opening. Immediately following the insertion of the instrument, the degree of bleeding was so profuse as to lead us to suspect the presence of a malignant neoplasm. Accordingly, the endoscope was withdrawn and in its place one finger was introduced, in an attempt to discover the origin of the bleeding. The sensation conveyed on palpation immediately recalled the impression so commonly received upon palpation of a carcinoma of the cervix in an adult (Fig. 1). Although there was induration of the right vaginal wall, the neoplasm of soft, friable tissue apparently originated in the intravaginal cervix. Withdrawal of the examining finger was associated with the expulsion of several pieces of gray, semitranslucent, friable tissue, which grossly suggested a sarcoma.

Upon studying sections of the tissue stained with hematoxylin and eosin, we were amazed to find that it had the histologic structure not of a sarcoma, but rather of an epithelial neoplasm. The surface of portions of the specimen was covered by

epithelium varying in depth but characteristic of the infravaginal portion of the cervix (Fig. 2). Lying beneath the epithelium and separated from it by a layer of poorly preserved connective tissue which varied in thickness were masses of epithelial cells. In certain places these gave rise to cord-like structures but the predominating arrangement was that of alveoli separated by thin strands of connective tissue, and lined by epithelial cells, which at some points had so proliferated as almost to fill the alveolus (Fig. 3). The cells, although varying in size, were for the most part euboidal in shape, and contained large, deeply staining nuclei, in some instances of the "coal pigment" type. In places, the basement membrane was fractured and the cells had invaded the intervening stroma.

Because some might wish to interpret this neoplasm as a sarcoma which presented an alveolar structure, additional sections were stained by Mallory's aniline blue method, in order to determine how great a part connective tissue played in the tumor

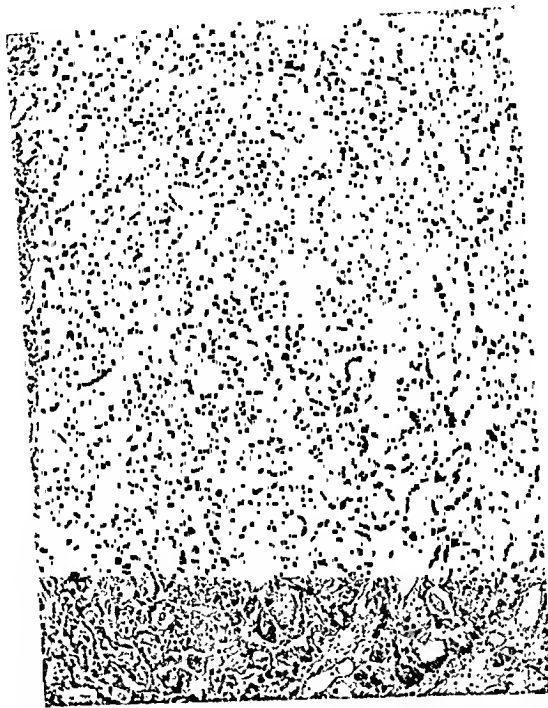


Fig. 3.—Alveoli lined by proliferating epithelial cells.

formation. These sections demonstrated clearly that, excepting the fine strands separating the alveoli, connective tissue was almost entirely absent. Moreover, no structures characteristic of a teratoma were encountered.

From this pathologic evidence, we were led to the diagnosis of an adenocarcinoma originating in the glandular structures of the cervix.

Since the administration of radium, with the apparatus then at our disposal was impossible, we hoped to extirpate at least a portion of the neoplasm and to follow this procedure by the institution of deep x-ray therapy. Upon opening the peritoneal cavity, the omentum was found adherent at several points to the peritoneum. The separation of loops of small intestine from the fundus gave rise to free bleeding, which was controlled by ligation. The body of the uterus, enlarged to five times the size regarded as normal for the child's age, was densely adherent to the region of the broad ligaments, and to the rectum (Fig. 1). During the manipulations, the friable fundus tore at one point and blood-stained, necrotic

From a review of the histories, two points of practical importance stand out. In the first place, as illustrated by the cases of Ganghofner, Glöckner, and by our own, a newgrowth as the underlying cause of vaginal bleeding in childhood may escape recognition for a considerable period of time. Although malignancy of the uterus in the first decade of life is unusual, we should guard against the error of at-

To recapitulate, I have succeeded in collecting from the literature a single record each of carcinoma of the vulva arising in the clitoris, and of carcinoma of the vagina, and eight records of a growth involving the uterus in which epithelial structures predominated. However, excepting the cases of Bejjajewa and Aginaga, concerning which available information is lacking, the diagnosis of true carcinoma seems justified in three only, those of Ganghofner, Glöckner and Kehrner, to which is added a fourth case mentioned in this article.

Recalling for a moment the cases of Ganghofner, Glöckner and Kehrner, we find that the pathologic evidence shows sufficient grounds for the diagnosis of a neoplasm arising from the epithelial structures of the uterus. Moreover, a careful study of the tissue removed from our patient convinces me that we are justified in regarding the neoplasm as an adenocarcinoma of similar origin. For further confirmation of the diagnosis, sections were submitted to Dr. James Ewing and to Dr. Frank R. Smith, of the Memorial Hospital. These gentlemen regard the lesion as a very cellular adenocarcinoma, with notable embryonic characteristics. Dr. Ewing, however, since he has never encountered such a newgrowth as primary in the cervix, feels that the neoplasm must have originated from some fetal rest in the pelvic cavity.

The child was reexamined several times after leaving the clinic. When last seen, the abdominal mass extended to the umbilicus and the upper end of the incision was the site of a metastatic growth about 4 cm. in diameter. The superficial veins of the suprapubic and epigastric regions were notably dilated. The right inguinal glands were enlarged and painful. The vaginal discharge persisted, being occasionally tinged with blood. There was a notable loss of weight, and the slightest exertion was associated with great fatigue. It was our hope that the patient might reenter the wards, in order that the neoplasm might be still further studied, but she died suddenly, May 30, 1929. No autopsy was permitted.

The patient stood the operation well. There was little postoperative discomfort and, excepting the upper end, the incision healed rapidly. The vaginal discharge continued. Unfortunately, the financial burden of hospital care was too heavy for the family, and since no free bed was available, the child was taken home on September 8, 1928. At this date, the upper end of the incision was still open and draining slightly and the uterine mass had increased definitely in size. Nevertheless, there had been some gain in weight and strength.

The removal of the organ without great hazard to life was obviously impossible. Accordingly, the omentum was drawn over the fundus and the abdominal incision closed.

tributing genital hemorrhage to a severe infection or to a precocious onset of menstruation, and disregarding the possible presence of a neoplasm.

Finally, the question arises regarding the appropriate method of treating such neoplasms. If for no other reason, the technical difficulties to be encountered in small children are so apparent as to preclude any attempt at complete surgical removal. Therefore, although without experience of the administration of radium in patients so young, but basing my opinion upon the results obtained in adult women, I am inclined to agree with Kehrer that the greatest hope is offered by this procedure, in combination with deep x-ray therapy.

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The patient, seventeen years of age, complained of amenorrhea and hematuria, the latter occurring for two or three days every second month. She also gave a history of having sustained an injury about the vulva at the age of five. Examination revealed extensive cicatrization from one ischium to the other, involving the rectum in its anterior surface and producing an eversion of the rectal mucosa. The vagina was absent, the urethral orifice completely cicatrized, almost in contact with the clitoris, and pulled to the right. A new functioning urethral orifice was present in the midline about 8 mm. anterior to the anus. There was no incontinence or polyuria. With a bladder sound the urethra was found to be 4 cm. long. By rectal examination a uterus and tubes could be felt high up. Cystoscopy revealed the cervix which presented at the posterior bladder wall.

At operation a transverse incision was made between the rectum and the traumatic urethra and the scar tissue incised upward carefully, using the anterior rectal wall as a guide until the uterus was reached. An incision was then made in the posterior bladder wall as close to the uterus as possible, the cervix pulled out of the bladder and its lips grasped with clamps to hold it in place. The bladder opening was closed in two layers, a catheter inserted through the urethra, and the newly formed vagina packed with iodoform gauze. Healing occurred without incident, and with constant dilatation the vagina has remained patent. The patient now menstruates normally every four to six weeks.

FRANK SPIELMAN.

*This study was made with financial assistance from the New York Committee of Maternal Health.

This method of staining was by far the best we tried, as all the others were either unsatisfactory or cumbersome. The method as described may sound complicated, but really is very simple, and gives

After the examination of the fresh semen specimen had been completed, smears of the semen were made employing the same technic that is used in making blood smears. The slides were air-dried, fixed by heat and then treated with a 1 per cent chlorozone solution. At first we left the slides in this solution for five to ten minutes or longer but now, with the ordinary thin smears we immerse them only one-half to two minutes. The slides are a little clearer and freer of mucus if left in the chlorozone longer, but the number of spermatozoa floated off is so large that it becomes a trial of patience to count and measure a sufficient number of cells. After the chlorozone bath the slides are washed with water and 95 per cent alcohol, dried, and stained with a modified Williams' stain, which we have lately changed still further. We use a mixture of Ziehl-Neelsen's carbolfuchsin 50 parts, saturated alcoholic solution of (bluish) eosin 25 parts, 95 per cent alcohol 25 parts. This solution is made up in sufficient amounts to last some time. When the slide is to be stained a few centimeters of the stain are put in a small container and carbolfuchsin added drop by drop until a precipitate occurs and a metallic luster covers the surface of the fluid. The stain is then filtered and used for one and one-half to five minutes on the slide. The length of time depends on the depth of staining required. We have found that if the slide is blotted dry before applying the stain, precipitation is less likely to occur. At the required time the stain is washed off rapidly but carefully with water and a counterstain, consisting of methylene blue diluted to one-third of the usual strength with distilled water, is applied for one to five seconds. If the slides are wanted for examination of the sperm under the microscope and for the counting of abnormal cells, the counterstaining is done more lightly, whereas for projection and measuring purposes, a deeper color of the heads, making them stand out more prominently, is advantageous. If one has many slides to do it is perhaps even wiser to stain the heads a reddish purple instead of blue, with very dilute methylene blue as the former is less fatiguing for the eyes.

IN SOME previous preliminary studies of seminal cytology,^{1, 2, 3} I called attention to the relation which apparently exists between the morphology and biometrics of the spermatozoon heads and fertility. Since that time I have been so frequently asked for the technic of carrying out such examinations that I deem it best to give this technic in extenso for all those who may be interested. The best way perhaps to set forth the details of the technic, with its possible pitfalls, is simply to describe how my assistant, Miss Helen Holt, B.S., and I examined a recent series of 141 couples.* The technic employed by us was as follows:

By GERARD L. MONCH, M.D., F.A.C.S., NEW YORK, N. Y.

CYTOLOGY

THE TECHNIC OF THE DETAILED STUDY OF SEMINAL

excellent results. With proper preparation of the slides, the head stains purplish and darker at the base than anteriorly. The anterior end knob can often be seen set into the base of the head as a little red knob. The body and tail of the sperm cell stain a deep red. A little practice is necessary to make proper smears, as at first the slides will either not be cleared sufficiently, or so much that many of the sperm cells are floated off, or the staining may not be perfect enough to allow of proper interpretation of the findings. After a little practice, however, good slides can regularly be obtained. If one does not wish to mix the dye and filter it each time a slide is to be stained, it is possible to use a stock solution mixed in the proportions given and filtered with almost equally good results.

After satisfactory slides of the semen specimens had been obtained, these were examined under the microscope fitted with a good substage condenser and mechanical stage, a Leitz 1/12th oil immersion lens, and a Leitz 10 X ocular, giving in our case a magnification of 1050 diameters. The normal and abnormal forms were then counted and tabulated. Usually 500 to 1000 cells were tabulated, but in difficult specimens 2000 and more cells were not infrequently counted before a definite conclusion could be arrived at.

I want to warn here against considering the number of sperms present in a stained smear as indicative of the number of sperm cells present in the original semen sample. The latter may have very many cells, and still only relatively few may appear in smears, as at times many cells are lost in the preparation of the slides. In some cases the spermatozoa float off the glass very easily, while in others they stick very tightly, even if the smears are prepared in exactly the same way. What this is due to, we have never been able to determine. It certainly has nothing to do with the goodness of the specimen, nor have the turbidity or the viscosity of the semen, nor the number of motile sperms any bearing on the case. Abnormal forms do not float off more easily than normal ones, and vice versa.

METHOD OF COUNTING AND TABULATING SPERM FORMS

In order to avoid any subjective influence in the counting of the normal and abnormal cells, the smears made by one of us (M.) were turned over without any comment whatsoever regarding the clinical aspects of the case to the other one (H.) who did the staining and the first counting and tabulation. Since most of our cases were clinic cases, and naturally came in some days after the specimens had been requested, it was usually true that neither one of us had any idea of the clinical history or the breeding record of the patients under consideration until we looked up these data after having concluded the laboratory examinations.

In tabulating our morphologic findings in any sample of semen we worked in pairs whenever this was possible: one counting and calling off the normal and abnormal forms seen, and the other marking them down. Thus it was entirely impossible for the one doing the microscopic work to tell how a count was progressing. Counting hundreds of cells in succession and without interruption on one specimen, it was often even impossible for the one calling off the cells to tell how good or bad the specimen under consideration would finally turn out to be. After the necessary number of cells had been counted, the findings were tabulated as given by a sample sheet here shown (Table I). Following this, we changed roles, the other one counting, and the first one marking them down. After this, a tabulation of the second count was made, and the two results compared. In order to get any agreement with one another, and in fact with oneself in tables of this nature, it is absolutely essential that one be sure of what one is looking at. There must be unanimity as to what constitutes a normal cell and what constitutes any given abnormality. Such unanimity is not to be reached immediately, and requires careful checking up of the various counts. To do this, one of us would repeatedly count over the same area contained within certain figures on the mechanical stage until absolute agreement was reached. Then the other one would count over the same area, and the end-results were compared. After this,

TABLE I. TABULATION OF SPERM CELL ABNORMALITIES IN CASE 112 (NORMAL)

PERCENTAGES		TOTALS		COUNT	
26	Abnormal	446	Normal	446	Normal
15	Head changes	154	Abnormal	6	Narrow
3	Body changes	92	Head changes	18	Small
		20	Body changes	31	Large
				24	Tapering
				1	Overdeveloped end knobs
				1	Amorphous solid staining
				11	Round
				3	Cytoplasmic extrusions
				1	Naked body fibril
				16	Thickened body
				32	Coiled
				1	Undeveloped
				9	Double

the identical area was again gone over, cell by cell, by both of us together. After almost two months of such checking up, we felt sure that each one of us regarded the various forms of spermatozoa seen in the same light, and thereafter it was not at all unusual for both of us to count a specimen and obtain absolutely identical figures, and nearly always our figures agreed to within one per cent or less. Only rarely specimens with many graded differences in the size of the cells or their width would offer difficulties, and in such cases we simply kept on counting until we felt that we had a good idea of the various abnormal-

malities present in the specimen. Then all the counts that had been made would be averaged for our final result.

In the previous articles mentioned above many of the abnormal forms of sperm cells seen by us have been depicted, and it is not deemed necessary to again represent them here, as we are limiting ourselves to the technic of the examinations. It is enough to say that of course no one specimen will contain all types of abnormal forms any more than any semen specimen with all normal cells will ever be encountered, since everything in Nature shows some variability both as regards shape and size. It is practically self-evident that a simple, more or less mechanical tabulation of the various sperm abnormalities will not directly answer the question of how good or bad any given sample of semen is. The various abnormalities have not all the same importance. The final evaluation of any semen from the standpoint of morphology can therefore only be made by taking all the vital points into consideration. It thus becomes extremely important to recognize the weight and value of the various abnormal forms encountered, as will be described in a paper reporting an extensive study of the morphology of the sperm cells.

THE TECHNIC OF CALIBRATING THE SPERM HEAD LENGTHS

After the morphologic examination of the sperm cells had been completed, we next measured the sperm head lengths found in the specimen. The method employed in these measurements was the one usually used in this type of studies. The image of the spermatozoon was projected at a known magnification onto a miniature screen and then measured with bow dividers controlled mechanically by a thumb screw. After a head length had been measured, the set bow dividers were placed against a scale ruled to 0.5 mm. Our light source was a Leitz-Wetzler carbon arc lamp with automatic feed control run on a 110 volt electric current. The microscope was a Zeiss, Stand I, instrument with the large tube used for photomicrography and microprojection. It had a revolving mechanical stage with a centering device. The tube length was always the same, 160 mm. Our lens system consisted of a complete Abbe illuminating apparatus with iris diaphragm and condenser of 1.40 N. A., a Zeiss 2 mm. N. A. 1.30 apochromatic homo-immersion objective, and a Zeiss No. 12 compensating ocular. A large photographic bellows was attached to the ocular end of the tube of the microscope, and a water filter with iris diaphragm was interposed between the light source and the microscope. This was 30 cm. from the light source and 20 cm. from the microscopic stage. Our screen consisted of a piece of hard wood fastened at right angles onto another board which by means of clamps could be held in any desired position. Hard wood was used so that the points of our bow divider would not cause pitting of the surface of the board and thus make

measurements difficult. The surface of the screen was covered by highly glazed (pin wheel) paper, so as to have as smooth and reflecting a surface as possible. When pitted, a new sheet of paper replaced the old one.

To determine our magnification we used a stage micrometer marking off the exact spot where the seven was to be put again in case it had to be moved. For a magnification of 3000 diameters the surface of the seven was 133 cm. from the light source.

We tried various magnifications in order to arrive at that point which would give us the greatest magnification without sacrificing either illumination or definition. For a while we worked at 4000 diameters but found the definition of the cells impaired as shown by apparent striagraphs on specimens which when measured and remeasured at 3000 diameters turned out to have a perfectly normal frequency distribution. We also tried magnifications of 5000 and 6000. While our illumination even at the latter magnification was still good, definition was decidedly poorer than at half this magnification. We thought, however, that if we measured in whole millimeters at 6000 diameters, which would be equivalent to half millimeters at 3000, we could reduce possible errors in measurements. Our graphs did in fact agree fairly well with those at 3000 diameters, but since the working field naturally was much reduced by such high magnifications, and the work slowed up without any at least appreciable gain, we finally went back to and stayed at the original magnification of 3000 diameters. Another advantage of working at the last magnification was the fact that Williams and Savage had done their work with it, and thus direct comparative results would at any time be possible. Indeed, one such result immediately became evident in comparing the graphs of the sperm head lengths of the bull with those of man. The graphs of normal bulls are steeper and narrower than those from human material. This is the more significant, since one would expect the reverse to be the case, as our class unit (0.5 mm.) was by comparison, because of the smaller size of the human sperm, coarser than the same unit employed by Williams and Savage for the sperm of the bull. At first we did not know whether the more scattered population found in man really represented a generally decreased fertility, the result of modern civilization, or was simply a species characteristic, but we must consider it now to be simply the latter, as perfectly normal specimens of semen from men who had impregnated their wives by a single coitus) showed such relatively great differences of the spermatozoon heads.

In order to be sure that our methods of calibrating the sperm head lengths were accurate, we checked and rechecked our results in a manner similar to that employed in making sure of our cytologic findings. Each one of us would measure a number of times the same cell and check results with his previous findings and with the measurements

made by the other one on the same cell. Each one of us would also calibrate and recalibrate the same specimen and check results. In this way we were finally able to obtain graphs which did not vary significantly when compared with the probable error. Fig. 1 shows two such calibrations made on the same specimen. Fig. 2 also shows a close agreement between two calibrations of 300 cells each made on the same specimen. The dotted line here represents the mean of both calibrations (that is, of 600 cells) but since it was so similar to the first calibration it indicates that the variations in the two graphs were very slight. Since such close agreement was usually present in our graphs, even when measuring only 300 heads of each specimen, we generally stopped at this figure, providing the three individual hundreds making up the curve did not differ significantly. If they did, as in the first 300 cells shown in Fig. 2, we always recalibrated the specimen, and took the mean of the two graphs, if these did not differ too widely, for

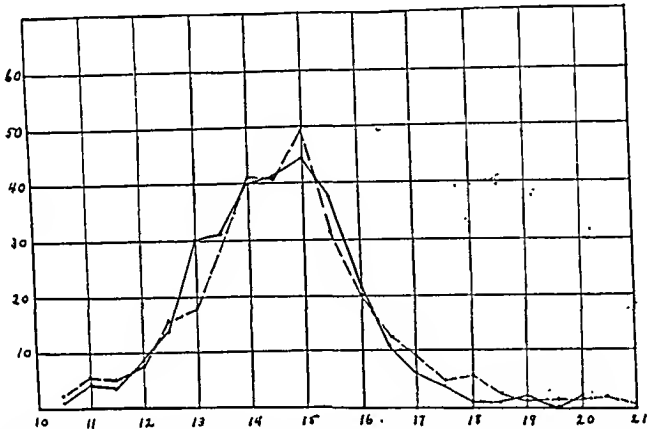


Fig. 1.—Case 13, B. This figure represents two graphs from calibrations of 300 cells each on the same specimen, and, except for some minor changes, the two frequency polyhedrons have approximately the same shape and mathematically it can be shown that the differences between the two curves as compared to the probability of error is not significant and not greater than may be expected from random sampling. Repeated graphs of this kind were frequently made to determine the accuracy of our methods and to compare the accuracy of various methods of calibration.

In this graph, as in the other one here reproduced, the figures on the ordinate or vertical line give the number of heads of any particular length observed, whereas the figures on the abscissa, or horizontal line, give the size of the heads in millimeters (and half millimeters) at a magnification of 3000 diameters.

our final result. Otherwise we made a third, and sometimes even a fourth and fifth graph to be sure of having measured a population large enough to be representative of the specimen under consideration.

We also wanted to know positively that our calibration results were not influenced by external factors. We made numerous trials to determine if our methods of obtaining and keeping the specimens changed the sperm head lengths. We did this in a manner similar to that employed to determine if the morphologic aspect of the cells differed under varying conditions of environment. We would divide a specimen of semen after calibrating a slide from it in the ordinary way into various parts, and keep these under different conditions for twenty-

four hours or longer, and then calibrate each portion separately; Table II shows the result of one such experiment. We see that the various morphologic changes observed are not due to external environment, but are really present, as has been shown by us in a previous publication,⁴ and also by microdissection.⁵ We also dried a semen specimen and redissolved it in normal saline, without finding any change in the size of the cells as compared with a fresh specimen. We found that under ordinary circumstances the sperms were not affected by external conditions (except that moist heat, while drying, as has been previously described, causes a disintegration of the cells), nor did keeping a semen specimen a number of days cause any changes except in the motility of the cells.

Whenever possible, and it was unfortunately not always possible, we worked in pairs when calibrating a specimen. One of us did the meas-

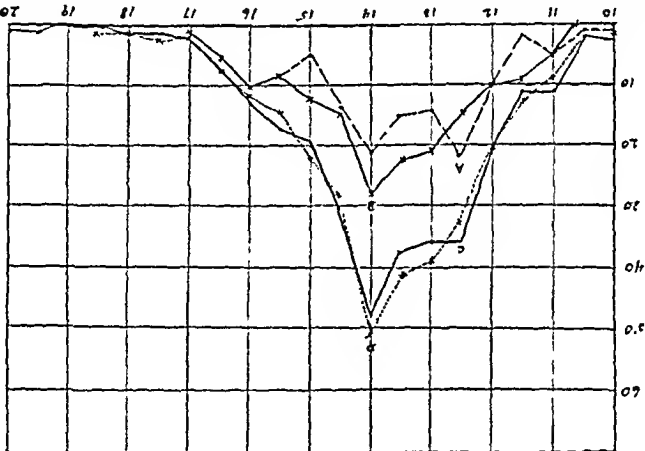


Fig. 2.—Repeated calibrations of 300 head lengths each on the same specimen, showing in the first graph the nearest approach to a bimodal graph which to date we have encountered.

A. First 131 cells calibrated.
 B. Next 169 cells calibrated.
 C. 300 sperm head lengths times 3000 diameters (first calibration). Result of curves A and B.

D. Mean of first and second calibration.
 On C mean equals 13.685 ± 0.060 .
 On D mean equals 13.828 ± 0.063 .

uring, and the other marked down the figures, so that the one calibrating did not know anything about how the graph was going. At intervals we changed roles until the full 300 cells were measured, when the graph would be constructed, and its mathematical functions determined by the methods usually employed in biometric studies.^{6, 7, 8}

As the apparatus employed in such studies as this is not only expensive but cumbersome, taking up much space and requiring a dark room, we tried out a flat or ocular screw micrometer kindly lent us by H. Leitz, Inc., on a number of specimens. After becoming accustomed to such an instrument, it is certainly possible to measure sperm heads

TABLE II

Three calibrations of 100 cells each made on the same specimen of semen which had been divided into three parts and placed into separate containers to determine whether or not the possibility of the container affecting the size of the cells had to be reckoned with. The three containers were: No. 1, a clean glass vial; No. 2, a skin condom; No. 3, a rubber condom as obtained from a dealer. The three portions of the specimen were calibrated in the usual manner at a magnification of 3000 diameters.

	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5	17	17.5	18	18.5	19	19.5	20	
I	—	1	—	2	5	6	8	10	13	16	15	10	7	3	2	—	—	—	—	—	—	—	—
II	—	—	2	2	1	8	10	11	16	18	10	11	3	2	2	1	1	1	—	—	—	—	—
III	1	1	—	3	3	5	8	7	13	15	12	11	7	5	3	3	1	—	—	—	—	—	1

The figures above the lines represent millimeters. The figures in the three horizontal rows represent the actual number of cells of the particular head length (at a magnification of 3000) counted. While there is some variation to be noted in the three columns, it is not more than one would expect to see. It is evident that there is no actual change in the size of the cells as the high number in each instance is to be seen at 14.0 millimeters. The tabulation of the abnormal forms also was almost identical in the three portions of the semen specimen.

We can also prove mathematically that the differences in these three samples are due to random sampling. Grouping the classes together in millimeters, since the half millimeter units here are too small, as shown by one or none of the sperm head lengths falling in some of the groups, we find that the mean on I equals 14.09 ± 0.098 ; on II, 14.01 ± 0.098 ; and on III, 14.29 ± 0.111 ; the standard deviation on I equals 1.45 ± 0.069 , is the same for II, and for III equals 1.64 ± 0.078 . The coefficient of variability for I equals 10.29 ± 0.49 ; on II, 10.35 ± 0.49 , and on III, 11.47 ± 0.55 . We have then, taking the greatest differences in the results, a difference of mean in II and III of 0.28, and of standard deviation of 0.19, and a difference in the coefficient of variability between I and III of 1.18. Calculating the probability of error on these differences, we get 0.28 ± 0.149 , 0.19 ± 0.104 , 1.18 ± 0.737 , that is, the differences are in no case even twice the probability of error, and therefore are of no significance but due to random sampling.

accurately, as repeated measurements on the same cell gave after some practice only very slightly varying results. At the same time, the measuring of 300 cells by this method is so fatiguing and endless that both of us felt that if condemned to such labor we would gladly change roles with Sisyphus.

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(1) *Moench*: *Am. J. Obst. & Gynec.* 13: 334, 1927. (2) *Idem*: *M. J. & Record* 126: 94, 1927. (3) *Idem*: *M. Herald* 46: 61, March, 1928. (4) *Idem*: *Biolog. Bulletin* 56: No. 4, p. 267, April, 1929. (5) *Idem*: *Am. J. Obst. & Gynec.* 18: 53, 1929. (6) *Babcock and Clausen*: *Genetics in Relation to Agriculture*, N. Y. and London, 1918. (7) *Pearl*: *Medical Biometry and Statistics*, Philadelphia and London, 1924, Saunders. (8) *Pearson*: *Tables for Statisticians and Biometrists*, ed. 2, London, 1924.

30 EAST FIFTY-EIGHTH STREET.

Letz, F. M.: *The Bicornuate Uterus*. New Orleans *M. & S. J.* 12: 211, 1929.

A case of bicornuate uterus with cystic right ovary and right-sided salpingitis is described for which the tube, ovary, and right uterine cornu were removed. The patient subsequently became pregnant and when at term was brought to the hospital moribund due to a condition "more typical of an intestinal obstruction." She died, but autopsy was not permitted.

FRANK SPIELMAN.

Mraz, F.: *Experiences with Elderly Primiparas*. *Wien. klin. Wochenschr.* 42: 935, 1929.

In an analysis of 117 cases of primiparae over forty years of age, the author comes to the following conclusions:

Elderly primiparae with normal fetal presentation and position do not offer a poor prognosis, even when the patient's general somatic condition suggests premature old age. Conservatism is to be recommended. In clear-cut cases of rigid cervixes where labor is unnecessarily prolonged, especially where the membranes have not ruptured, lateral cervical incisions 1-1.5 cm. in length may be used. Indications for vaginal operative procedures and their morbidity are the same as for the younger women in labor. Cesarean section is recommended in breech presentations with premature rupture of membranes. The third stage of labor is more dangerous than in younger women. Active measures are more often necessary. Elderly women with chronic organic lesions, especially heart lesions should be warned against pregnancy. Each case is to be judged individually.

FRANK SPIELMAN.

SHORTENING OF THE TRANSVERSE DIAMETER OF THE SUPERIOR STRAIT

ITS CLINICAL SIGNIFICANCE

BY HERBERT THOMS, M.D., F.A.C.S., NEW HAVEN, CONN.

(From the Woman's Clinic of the Yale University School of Medicine)

THE more one becomes familiar with pelvic mensuration and its relation to successful parturition, the more impressive becomes the importance of certain pelvic diameters. This is particularly true of the anteroposterior and transverse diameters of the superior strait. The importance of the former is well known and appreciated, and it is the purpose of this communication to dwell upon the value of the latter, and to suggest that accurate knowledge of its length is in certain instances of the utmost importance.

Of the methods used to determine these two diameters, it may be said in brief that the estimation of the anteroposterior diameter, by means of measuring the external conjugate, the diagonal conjugate, by the use of internal pelvimeters, and by x-ray methods is well established. However, the determination of the transverse diameter of the superior strait is a very different problem. In fact, external pelvimetry as known and practiced at the present time offers no means of adequately determining the length of this line. Internal pelvimetry is practically in the same category, and it is only by means of some such method of x-ray pelvimetry as I have previously described¹ that accurate estimation of this diameter may be made.

The importance of accurate knowledge of this diameter becomes apparent when we consider the more usual contractions found at the superior strait. It is obvious that where shortening of the anteroposterior diameter takes place adequate transverse room must compensate. This fact is well known and appreciated by obstetricians in dealing with cases of parturition when the patient presents a simple flat pelvis. In other instances where shortening of the transverse diameter obtains and the anteroposterior remains normal, such as is often seen in the small round or generally contracted pelvis, the importance of accurate knowledge of such transverse shortening is again obvious.

This shortening of the transverse diameter of the inlet is by no means a new conception. Ever since contracted pelvis have been studied, obstetricians have been cognizant of its importance, particu-

¹J. A. M. A., 92: 1515-1516, 1929.

lary in its relationship to the simple flat and the generally contracted pelvis. It is true, however, that accurate knowledge of the amount of transverse shortening in these cases has not been available until the advent of x-ray pelvimetry.

Among the etiologic factors which cause shortening of the transverse diameter of the superior strait may be mentioned, disease, such as severe rickets and osteomalacia, trauma, hereditary, racial, and sex influences. In the roentgenographs and case summaries here presented, some of these etiologic factors were present, and the influence on the course of labor of the resultant transverse contraction is briefly summarized and commented upon.



FIG. 1.

CASE 1. *Transverse Contraction of the Superior Strait Due to Osteomalacia.*—Patient, colored, aged nineteen. First symptoms of deformity made manifest by bowing of legs following influenza attack in 1918. Two cesarean sections, 1923 and 1925, performed in this clinic. At present time process seems arrested. X-ray pelvimetry not done when accompanying roentgenograph was made. Marked transverse shortening of superior strait very evident. Measurements in 1923 were: spines 24, crests 25, trochanters 26.5, external conjugate 20, diagonal conjugate 10.5, between tuberosities 5, anterior sagittal 7, posterior sagittal 9.5 cm.

Comment.—Osteomalacia is so rare in this country that its finding is regarded as a curiosity. When it is discovered as a rule the deformity is so pronounced that diagnosis and treatment are obvious. Nevertheless in its early stages this disease may be accompanied with but slight pelvic deformity. In such an instance only by means of x-ray pelvimetry could exact knowledge of the amount of transverse diameter shortening be obtained.

CASE 2. *Transverse Contraction of the Superior Strait Due to Trauma.*—The patient, Miss F. R., aged seventeen, received a fractured pelvis in an automobile accident July, 1927. Was first in this clinic November, 1927. Pelvic measurements

at that time were: spines 25, trochanters 31, external conjugate 19.50, right oblique 22.5, left oblique 22.5 between tuberosities 8, anterior sagittal 6, posterior sagittal 9.5, anteroposterior 12. X-ray pelvimetry of the inlet shows anteroposterior diameter 11.25, true transverse diameter 12.00. However, the transverse diameter of the anterior half of the superior strait is markedly shortened by the deformity.

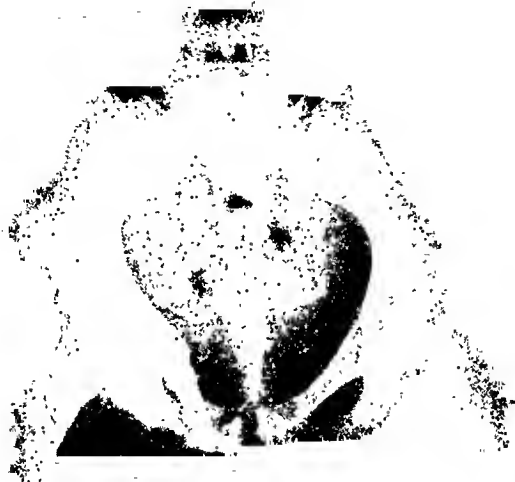


Fig. 2.

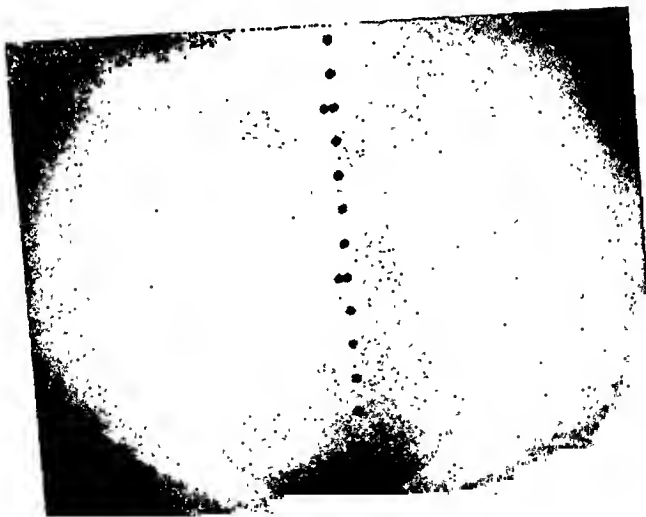


Fig. 3.

Comment.—Transverse shortening of the inlet is a common sequelae of fracture of the pelvis. An accurate knowledge of the amount of the transverse shortening in this case was important from a medicolegal standpoint in forming an opinion as to the possibility of subsequent successful parturition.

CASE 3. *Transverse Contraction of Superior Strait Due to Congenital ? Causes.*—The patient, a white primipara, aged twenty-three, normal pregnancy, nonegement of presenting part. Cesarean section for disproportion. Child weighed 3600

gm. Spines 21, erests 26, trochanters 29.5, external conjugate 17, between tuberosities 8, anterior sagittal 9, posterior sagittal 9. X-ray pelvimetry of inlet shows anteroposterior diameter 12.25, transverse diameter 11.50.

Comment.—This case is remarkable in that external measurements were quite misleading. The resemblance of the shape of the superior strait to that characteristic of the fetal pelvis is striking. X-ray pelvimetry alone demonstrated transverse shortening, which was probably the factor producing the nonengagement of the head at term. This type of pelvis is occasionally associated with high assimilation but lateral roentgenograms in this case failed to reveal any extra vertebra in the sacrum.

CASE 4. *Normal Pelvis With Unusual External Measurements*.—The patient, a white primipara, aged twenty-three, small woman. Weight at first examination 98 pounds. Measurements: spines 22, erests 24.75, trochanters 29, external conjugate



FIG. 4.

16.75, between tuberosities 8 gm. Duration of labor twelve and one-half hours. Midforceps and easy extraction of 3256 gm. child. X-ray pelvimetry of inlet: Anteroposterior diameter 11.25, transverse 12.5.

Comment.—The external measurements are very misleading. This woman actually has quite a good pelvis. This is in spite of the external measurements, which are characteristic usually of a much smaller pelvic inlet. A rather easy forceps with a 2566 gram baby is proof of the adequacy of the pelvis. X-ray pelvimetry of the inlet, showing the true inlet measurements, when the patient was five months pregnant, was of considerable reassurance to the attending obstetrician.

CASE 5. *Generally Contracted Pelvis (Small round)*.—White primipara, aged fifteen. Spines 23.5, erests 24, trochanters 29, external conjugate 16.5, between tuberosities 8.5, anterior sagittal 4.5, posterior sagittal 7. X-ray inlet, anteroposterior 10.0, transverse 10.25. Trial of labor resulted in no engagement, and labor finally terminated by difficult version and extraction. Child weighed 3210 gm. CASE 6. *Generally Contracted Pelvis (Small round)*.—Colored primipara, aged seventeen. Spines 22, erests 24.5, trochanters 28, external conjugate 18, diagonal

conjugate 11, between tuberosities 8, anterior sagittal 7, posterior sagittal 8. Induction of labor just before term ended in difficult high midforceps. Child weighed 2970 gm. X-ray pelvimetry of inlet: Anteroposterior 10.0 cm., transverse 10.5 cm.

COMMENT ON CASES 5 AND 6

These are typical small round pelvises so often seen particularly in the colored race, where it is the most frequent contraction of the pelvis. The summary shows

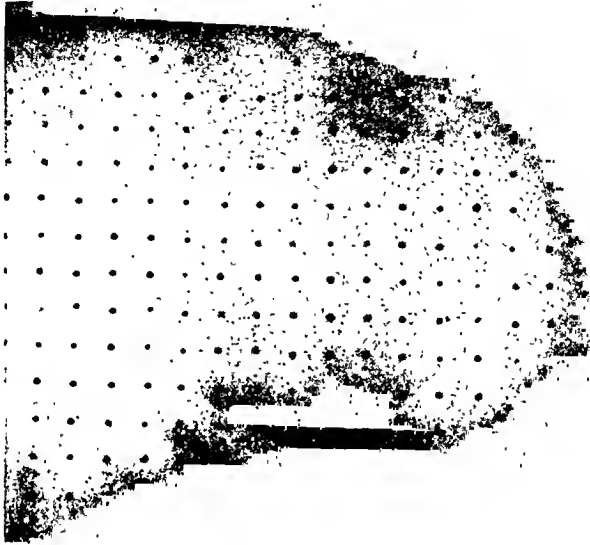


Fig. 5.

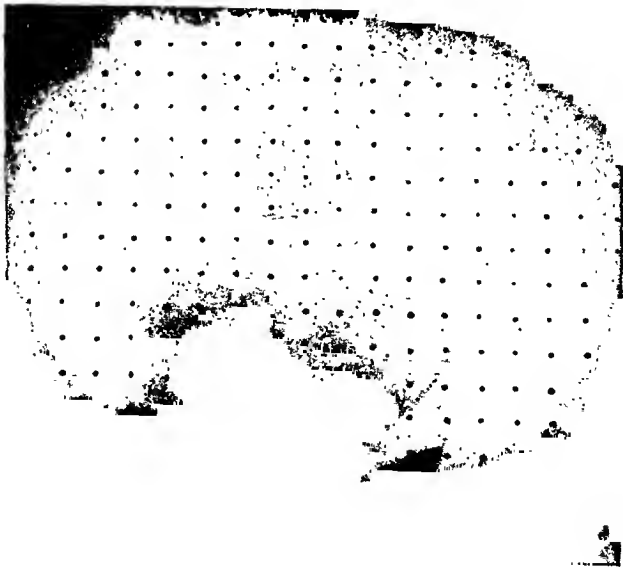


Fig. 6.

the course of labor in both cases to be quite characteristic. The external measurements all point to transverse diameter shortening which might not, however, be present, as witness Case 4 above. The anteroposterior diameter of the inlet in

these cases is often normal. The transverse diameter is the important measurement, as far as engagement of the vertex is concerned. Without x-ray pelvimetry in these cases the estimation of this diameter is guesswork.

CONCLUSIONS

1. The importance of x-ray pelvimetry of the superior strait by the method recently described should again be emphasized.
2. By only some such method may the amount of shortening of the transverse diameter be accurately estimated.
3. External pelvic measurements, as far as estimating accurately this diameter, are practically valueless.
4. The importance of the transverse diameter of the superior strait, particularly in the simple flat pelvis and in the generally contracted pelvis, should be recognized by all physicians who deliver women.

NEW HAVEN HOSPITAL.

SODIUM AMYTAL IN THE TREATMENT OF THE LATE TOXEMIAS OF PREGNANCY

By JOHN H. MOORE, M.D., F.A.C.S., Grand Forks, North Dakota

ROBINS, et al., in a comprehensive study entitled, "Sodium Iso-amylethyl Barbiturate in Obstetries," which appeared in THE AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY for September, 1929, included in their report eight cases of eclampsia in which this drug was used.

I wish to report four cases of grave toxemia, occurring late in pregnancy, in which sodium iso-amylethyl barbiturate (sodium amytal) played an important part in treatment.

The first three cases of this series were nephritis complicated by pregnancy. Fear of approaching labor added a serious mental hazard to these patients who, at best, were poor obstetric risks.

REPORT OF CASES

CASE 1.—Mrs. J. S., gravida 1, para 0, white, aged twenty-five years. Estimated confinement July 8, 1929. Her nephritis dated from an attack of scarlet fever in 1924. She had had no prenatal care until two weeks before admission to the hospital. At that time she complained of headache and insomnia. The urine contained 3-plus albumin, no sugar, hyaline and granular casts, and her blood pressure was 196/100. She refused hospital treatment. Two weeks later, on June 10, 1929, she finally consented to enter the Deaconess Hospital. The urine findings were unmann negative, and blood urea, 80 mg. The fetus was estimated to be about eight months' gestation and was in good condition.

On the morning of June 11, 1929, she appeared very nervous and apprehensive. There was twitching of the muscles of the face. It was decided to induce labor

and 1 gm. of sodium amytal in 10 c.c. of sterile distilled water was given intravenously at the rate of 1 c.c. per minute. Four minutes after the injection was started, she was sleeping quietly and at the end of the injection she was well relaxed, her blood pressure was 170/100, respirations 20 and very quiet and pulse 80 and of good quality.

At 9 A.M. cervical pack and catheters were inserted. The patient strained slightly when the cervix was grasped with tenaculum forceps and a weak nitrous oxide-oxygen mixture was given for five minutes. In the light of subsequent events, this gas anesthesia seemed superfluous. She was returned to her room with a blood pressure of 186/112. Labor began one and one-half hours later. Scopolamine, 0.00033 gm. was given by hypodermic at 12:45 P.M. At 3 P.M. her condition suggested moderate shock. The skin was cold and there was considerable pallor, blood pressure 140/80, pulse 70 and of fair quality. There was no evidence of hemorrhage and the heart tones were good. External heat was applied and caffeine sodio-benzoate, 0.066 gm. was given by hypodermic. Labor was temporarily delayed but at 8:37 P.M. she delivered a female infant weighing 5 pounds, 8 ounces. She was given scopolamine, 0.00033 gm. two hours before the birth and nitrous oxide-oxygen anesthesia for a few minutes late in the second stage. The patient awakened twelve hours after the delivery with no knowledge of the induction of labor or of labor itself. The baby showed no asphyxia at birth and weighed 5 pounds and 10 ounces on discharge the twelfth day. The mother made a satisfactory afebrile convalescence but two months later still showed residual nephritis with a moderate hypertension.

CASE 2.—Mrs. L. L., gravida ii, para 0, white, aged twenty-nine years was, by a coincidence, admitted to the hospital on the same date as Case 1. She had had nephritis since 1923. I first saw her in April, 1928, when she was brought to the hospital in the second stage of labor and delivered a six months' macerated fetus. She continued under medical treatment for most of the summer of 1928. Future pregnancies were interdicted. In December, 1928, she again came for treatment, stating that her last menses had occurred October 28, 1928, and that she would do anything required of her in the line of treatment except that she would not permit a therapeutic abortion. Despite prenatal care, her nephritis became progressively worse. On admission to the Deaconess Hospital her blood pressure was 186/120, there was generalized edema and the urine contained 2-plus albumin, granular casts, pus and blood. Her hemoglobin was 76 per cent (Dare), R.B.C., 4,010,000; W.B.C., 14,200; blood urea, 76 mg.; Blood creatinine, 1.52 mg., and Wassermann negative. The fetus was estimated as being close to the end of the seventh month of gestation. Conservative treatment was employed for a few days to improve the chances for the baby. On the late afternoon of her fifth hospital day the patient developed severe epigastric pain and a violent headache. Her blood pressure was 200/120. Her remarkable fortitude suddenly left her and she became hysterical. One gram of sodium amytal was given intravenously as in Case 1 and labor was induced by means of cervical pack and catheters with no additional anesthesia. She slept soundly all night but had uterine contractions at ten-minute intervals. Her blood pressure was 180/100. Twenty-four hours later the pack and catheters were removed and amnesia was continued by scopolamine in doses of 0.00066 to 0.00033 gm. by hypodermic. Labor was terminated by low forceps delivery under ethylene-oxygen anesthesia. The premature male infant weighed 3 pounds, 12 ounces. The mother was discharged on June 30, 1929, after a reasonably satisfactory convalescence. Her highest temperature, 99.6° F., occurred twelve hours after delivery. The baby was discharged on July 13, 1929, weighing 5 pounds, 2 ounces. In October, 1929, the mother stated that she was feeling fine although she had slight albuminuria. The

baby was the picture of health, though he had had an inguinal herniotomy done when he was two months old.

CASE 3.—Mrs. M. G., gravida i, para 0, white, aged thirty-four years was admitted to the Deaconess Hospital on June 29, 1929, with a severe toxemia of pregnancy at seven months' gestation. Her nephritis began in 1926. She had had no prenatal care. The urine output had been scant for the preceding three weeks and during the three days prior to admission she had complained of visual disturbances and headache. There was extreme generalized edema, a uremic odor to her breath and the blood pressure was 172/104. The fetus was in good condition. A catheterized specimen of urine boiled solid and was loaded with coarse and fine granular casts, renal epithelium, pus and blood. The hemoglobin was 76 per cent (Dare), R.B.C., 4,390,000; W.B.C., 14,100; blood urea, 70 mg.; blood creatinine, 0.805 mg., and Wassermann negative. Her condition appeared so critical that she was placed on supportive and eliminative treatment in which intravenous injections of glucose solution played an important part. On July 4 her edema had largely disappeared, her blood pressure was 138/84 and she had passed 3120 cc. of urine in the twenty-four-hour period. On July 9 she became despondent and insisted that she would surely die. Her blood pressure was 176/120, blood urea 84 mg., and blood creatinine 1.9 mg. She was crying constantly. She was given 0.5 gm. of sodium amytal intravenously in preparation for the induction of labor. There was an abrupt drop in blood pressure to 120/74 and for a moment the patient's condition appeared alarming. Marked pallor developed but sweating did not occur and the pulse rate did not rise above 100. There was no dyspnea or vomiting. Ten minutes later her blood pressure was 150/100 and cervical pack and catheters were inserted without additional anesthesia. She slept quietly all night, though uterine contractions occurred with increasing frequency. A male infant of about seven and one-half months' gestation was delivered about twenty-six hours after the induction of labor. Amnesia during labor was continued with scopolamine and ether was used for the delivery. The baby weighed 4 pounds and was in excellent condition. The placenta showed numerous large and small yellow infarcts and one large fresh thrombus. Convalescence was slow although the temperature did not go above 100.4° and that on the fourth postpartum day. The baby weighed 4 pounds, 11½ ounces on discharge, July 30, 1929. In October, 1929, the baby was in splendid condition and the mother felt well although she showed unmistakable signs of a latent nephritis.

The fourth case in this series is the only one who showed all the symptoms and signs of eclampsia but the intravenous and oral administration of sodium amytal gave such excellent results in this case that I am prompted to report it.

CASE 4.—Mrs. I. S., gravida iii, para ii, white, aged thirty-six years, was admitted to the Deaconess Hospital after an automobile ride of some thirty miles during which she had a convulsion. Her previous history was negative. A physician saw her for the first time during this pregnancy at the onset of the eclamptic attack and gave her morphine sulphate 0.033 gm. by hypodermic before sending her to the hospital.

On admission to the hospital her blood pressure was 232/136. There was generalized edema, moderate stupor, twitching of the muscles of the face and left arm, and a decided uremic odor to the breath. A catheterized specimen of urine boiled solid with albumin and contained coarse and fine granular casts, a moderate amount of pus and numerous red blood cells. Her hemoglobin was 87 per cent (Dare).

R.B.C., 5,200,000; W.B.C., 15,000; blood urea, 88 mg., and blood creatinine, 4.7 mg. The fetus was estimated as being about eight months' gestation and was in good condition.

She was given 0.5 gm. of sodium amytal intravenously. This produced an apparently natural sleep and her blood pressure came down to 190/124. Glucose was given intravenously. She slept all that day and through the night though she could be aroused to take liquids. October 13, 1929, her second hospital day, found her blood pressure 226/124, but the patient appeared comfortable. At 3 A.M. the following morning she became restless and complained of epigastric pain. Her blood pressure was 230/140. She was given a tablet of sodium amytal, 0.325 gm., in water by mouth. She went to sleep and had to be aroused at 7 A.M. for the administration of castor oil and quinine. Labor began at 2:30 P.M. Sodium amytal, 0.325 gm. was given by mouth twice during the afternoon and, in addition, scopolamine 0.00066, 2 doses and 0.00033, 1 dose by hypodermic. She was delivered the same evening of a male infant of eight months' gestation, weighing 4 pounds, 11 ounces. The baby was vigorous, cried spontaneously and showed no evidence of asphyxia. Ether was used for five minutes only during the late second stage to prevent too rapid a delivery. The patient was returned to bed with a blood pressure of 194/112 and awakened four hours later with no knowledge of her labor. The convalescence of mother and baby was satisfactory. On discharge October 30, 1929, the mother's urine was normal and the baby weighed 5 pounds, 4 ounces.

COMMENT

This series, although small, consisted of patients who were grave obstetric risks. The problem of anesthesia as well as analgesia was greatly simplified by the use of sodium amytal. No ill effects were noted in the four premature infants of these toxic mothers. Two of the mothers showed symptoms of moderate shock, one six hours and the other ten minutes after the injection of sodium amytal. The depression in both cases was but temporary and occurred in patients who had been unusually nervous and apprehensive before the induction of labor. The prompt anesthetic and sustained analgesic effect in all of these patients was satisfactory.

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NORTHWESTERN NATIONAL BANK BUILDING.

A REPORT OF 90 CASES OF ENDOCERVICITIS TREATED WITH A NEW TYPE OF ACTUAL GAUTERY

BY HAROLD W. BAKER, M.D., F.A.C.S., AND G. STANLEY MILES, M.D.
BOSTON, MASS.

THE objective symptom of endocervicitis is vaginal discharge. The following subjective symptoms have been attributed to this disease, backache, pelvic pressure, pelvic pain, and nervousness. There is clinical and experimental evidence that a chronically infected cervix may be the focus of infection causing systemic disturbance, e.g., arthritis. Furthermore an infected cervix is a cancer liability, especially in women who have been pregnant. For these reasons it is as logical to treat endocervicitis as it is to treat other foci of infection. It is interesting to note that of 669 patients seen at the Free Hospital for Women, with carcinoma of the cervix none ever had gauterization and of 1408 gauterizations none are known to have developed carcinoma.* The aim in treating this condition is to remove or destroy the glandular tissue of the endocervix. Medical treatment at its best is only palliative and fails to afford a cure in the majority of cases because the antisepsics and corrosives fail to reach the bottom of the glands. The use of radium is not satisfactory, since, in the doses necessary to cure the infection, it may result in stenosis, sterility, menstrual disturbance, or the lighting up of a latent pelvic infection. Surgery is satisfactory, but there are many cases in which this is too radical.

Gauterization of the cervix by means of the actual cautery has given satisfactory results and is a well-established procedure. Red-hot carbonization, however, has the disadvantage of cutting and carbonizing tissues, with the result that there may be either annoying primary hemorrhage, or secondary hemorrhage when the slough of necrotic tissue breaks away after a period of six to fourteen days.

Furthermore carbonized tissue is a heat insulator and prevents penetration sufficient to effect a cure, unless thorough carbonization is performed under operating room conditions. Because of those handicaps and through a desire to make effective cervical gauterization, the author has devised a new type of cautery (see Fig. 1†). It consists of a bakelite handle with a switch in such a position as to be easily accessible without changing the position of the hand. The curved platinum tip is two and one-quarter inches long. The tip is introduced into the cervical canal while cold. When the current is turned on the

*Pemberton, Frank A., and Smith, George Van: *AM. J. OBST. & GYNEC.* 17: 165, 1929.

endocervix is heated gradually and only a very superficial area (to a depth of one mm.) is actually charred. The heat penetrates deeply enough to destroy the depths of the glands and to cause thrombosis of the blood vessels. There is no primary hemorrhage and in the course of one to two weeks the endocervical slough comes away leaving a clean granulating surface which will gradually be covered with new glandular epithelium from above and with squamous epithelium from the portio vaginalis in the region of the external os.

On account of the slight sensory nerve supply to the cervix an anesthetic is unnecessary since patients experience very little discomfort or pain.



Fig. 1.—Baker Caутery.

The series herein reported consists of 90 cases of subacute and chronic endocervicitis. Forty-eight patients had cauterization without anesthesia; the remainder had cauterization performed during operations for other causes primarily, but in whom leucorrhœa was also a complaint. It was necessary to cauterize only one patient a second time. The patients have been examined three months to one year following cauterization. Results are shown in Table I.

TABLE I. CAUTERIZATION UNDER AN ANESTHETIC

NUMBER OF CASES	UNIMPROVED	RELIEVED	CURED
42	0	6, or 14.2%	36, or 85.7%
CAUTERIZATION WITHOUT ANESTHETIC			
NUMBER OF CASES	UNIMPROVED (UNTIL AFTER SECOND CAUTERIZATION)	RELIEVED	CURED
48	1, or 2%	5, or 10.4%	42, or 87.5%

Five patients of this series have become pregnant since cauterization. One miscarried in the third month, two had normal pregnancies, ending in cesarean delivery, so as not to injure results of previous reconstructive operations, and two were normally pregnant when last seen, but are now untraceable. Not a single case of stenosis has been seen following this type of cauterization.

The results following the use of this type of cautery have thus far been so satisfactory that the instrument deserves more extended application in the treatment of endocervicitis.

DIATHERMY as used in gynecologic work is one of the most overadvertised and at the same time one of the most severely condemned modalities, depending upon the viewpoint of the authors. Controlling observations proved that the extravagant claims for its efficacy were not supported by the results obtained and again the subsequent reaction overshoot the mark. This was particularly true of gonorrhoeal affections. In such instances misunderstood theoretical premises were advanced in order to undergird the overenthusiastic clinical reports.

It was claimed that by diathermic heat gonococci can be killed within the living tissues without damaging the vitality of the structures concerned. As an essential item there was always quoted the traditional assertion concerning the hypersensitiveness toward heat of the gonococci. However laboratory experiments have proved that if cultures of gonococci are exposed to heat exceeding the heat permitted to die in the living subject, the overwhelming majority of them will remain alive. The direct destruction within the living tissues by heat or chemicals of pathogenic germs is still an unsolved problem.

Whatever is accomplished in this direction is due to the "changing of the soil." This change is brought about by the coextensive collaboration of two agents; the amelioration of the local circulation and the attraction thereto of the defensive somatic forces. It is an established fact that locally applied diathermy will increase the circulation and at the same time the macrophages of the reticulo-endothelial system are attracted to any area in which an increase of metabolism is established, in this instance by the diathermic heat. It is true that occasionally in acute gonorrhoea quick and definite results may be obtained by prolonged diathermic applications and that the same modality may secure decided improvement in chronic cases, but in order to glean a clear survey of the whole situation it is necessary to analyze and summarize the clinical results.

The female urethra and the vagina normally show a strong tendency toward eliminating gonorrhoeal infections and as a rule these organs overcome in short order at least the acute stage without any special therapy. It is true enough that the subjective symptoms are in a strikingly short time relieved by medical diathermy and very often the subsidence of the discomfort is taken for a cure, which of course in many instances is an erroneous supposition.

By G. KORSCHER, M.D., CHICAGO, ILL.

DIAATHERMY IN GYNECOLOGY*

The same holds good of acute gonorrhoeal endocervicitis.

Medical diathermy alone will almost never cure chronic gonorrhoeal endocervicitis or endometritis, but it is a very powerful support to the routine treatment. The principles of the technic of administering diathermy deserve some discussion. The introduction of an active electrode into the urethra or cervix or uterine cavity is not only apt to produce serious complications but is also entirely unnecessary. Intra-urethral electrification is not only very painful but also apt to produce periurethral abscesses and occasionally perforation of the urethral wall. The intrauterine administration of high frequency currents is quite often followed by extensive parametritis and perimetritis, the development of ovarian abscesses and pyosalpinx with all the dangers of pelvic peritonitis. It is absolutely unnecessary to take such chances because the intimate apposition of the active electrode to the urethra, respectively cervix and uterine body, permits the operator to develop within these organs any desired degree of heat. These facts were experimentally proved.

It may be useful to mention a rather common error. It is believed in many quarters that the results in diathermy are proportionate to the degree of heat developed. It must be understood that heat carried closely to the physiologic limit, though not producing coagulation, causes precipitation of the globulins within the cells, thus impairing their vitality. The patient during the application of diathermy should report a distinct sensation of warmth but not of heat, in the latter case the amount of current has to be reduced.

Another important factor is the length of each seance. Each sitting must extend over at least thirty minutes. With the rising tolerance of the patient this time is progressively extended up to one to two hours.

In chronic endocervicitis and endometritis the diathermization is followed by a decided increase of secretion which has to be taken care of by antiseptic tampons.

Emptying of the bladder and rectum previously to the treatments is imperative.

It may be truthfully asserted that the combination of the routine treatment with diathermy and aseptic protein-shock, furnishes definite relief in a good many instances of chronic gonorrhoeal endocervicitis and endometritis that resisted all other therapeutic efforts.

While in chronic parametritis and perimetritis the administration of medical diathermy certainly shortens the time of absorption, the most salubrious effect of this modality is shown in acute and subacute cases of this kind. There is nothing that so quickly relieves the suffering of the patient as the application of heat produced by high frequency currents. The theoretic objection that diathermy should not be administered if there is any suspicion of infiltration is not supported by

clinical experience. Even if diathermy would produce a melting down of a parametric exudate such an event would simply pave the way for colpotomy and definite cure.

Surgical diathermy has a wide field of usefulness in gynecologic work. Chronically infiltrated perivascular glands and ducts are quickly and definitely obliterated by electrocoagulation with a fine wire. Bartholin glands may be readily excised by the electric knife and the sterilization of the resulting surfaces enables the operator to close tightly the excision wound with an excellent change for primary reunion.

The destruction of uterine carcinomas by electrocoagulation furnishes excellent results. This method is rapid and bloodless, and does immediately away with all the well-known bothersome symptoms. Exfoliation of the scab and epithelialization is obtained in from eight to ten days.

Electrocoagulation is of signal value in dealing with recurrences after removal of cancerous uteri by hysterectomy and in primary imperable cancers of the portio and cervix.

Electrocoagulation immediately does away with the lancinating pains, with the foul discharge and hemorrhage, while the combination with radiotherapy furnishes definite results in a surprisingly large number of instances. The insertion of the radium container follows immediately the electrocoagulation, thus taking advantage of the influence of the rays of reaction around the coagulation, the so-called perithermic zone, which in short order is innudated by the defensive cells of the reticulo-endothelial system. This procedure harmonizes with the modern views on cancer therapy which consider the general systemic reaction to be of prime importance.

Whether or not this combined method should be substituted for hysterectomy in operable cases is a matter of future consideration. Surgical diathermy of cancers of the female bladder has established its superiority over other methods in the same way as in dealing with malignancy of the urinary bladder in the male.

PREGNANCY IN A BICORNUATE UNICOLLIS UTERUS WITH THE CHILD OCCUPYING BOTH HORNS

BY JOHN JOSEPH GILL, M.D., F.A.C.S., CHICAGO, ILL.

MRS. M. L., white, well nourished, American woman, store clerk, born in 1901. Her early history is of negative value as also is the family record. She had her first menstrual period in 1914 and married on May 21, 1921. Her periods had always been regular, twenty-eight day type, moderate amount, painless and of five days' duration, the last regular one appearing January 1, 1926. Then from February



Fig. 1.

1, 1926, she flowed continually but not profusely, very dark with small clots, frequent backache but no pains, and no leucorrhœa. She slept well and had a good appetite. Examination on April 5 revealed a bloody vaginal discharge, perineum intact, cervix soft and swollen, body of uterus was enlarged about like a two months' pregnancy. To the left and attached to the uterus a large soft mass could be palpated, which I diagnosed as tubal pregnancy. A laparotomy was performed by me on the following day.

At operation the pelvis was explored: A bicornuate uterus was found with a pregnancy in the left horn, the right ovary contained a large corpus luteum cyst. The appendix was removed and the abdomen closed. Spontaneous abortion occurred nine days later. The patient left the hospital April 19, 1926, in good condition.

Her general health continued good and periods regular until October 26, 1928, when her second pregnancy began. Life was first felt on March 12, 1929. For the first three months there was slight bleeding and no nausea, progress was normal until June 21, when she entered Wesley Memorial Hospital on account of uterine bleeding. A roentgenogram at this time shows the fetus as it swung in a hammock with the head and arms in the left horn and breech in the right horn of the uterus. (Fig. 1.) On the following morning a low lap cesarean section was done, delivering a five and three-fourths pound baby girl. A large placenta weighing one and one-half pounds occupied the lower uterine segment.

The mother ran a stormy convalescence for seven days, at the end of which time she developed a severe hemorrhage, pallor, blurred vision, thirst, air hunger, and tingling of the skin. (Red cells 1,700,000, white 25,050, hemoglobin too low to read.) At this time she was transfused with 500 c.c. of the husband's blood and made a rapid and complete recovery. Mother and child in good condition returned home July 14, 1929.

After such a harrowing experience and upon reading the reports of other cases, I doubt if one is justified in leaving in the pelvis (even though the patient may want more children), such a poorly developed uterus to threaten with another pregnancy her life.

UTERUS BICORNIS UNICOLLIS WITH ATRESIA AND HEMATOMETRA OF ONE HORN

BY W. H. GRANT, M.D., AND DAVID ROSE, M.D., BOSTON, MASS.

(From the Gynecological Department, Boston Dispensary)

THIS case is reported because of associated congenital anomalies as well as the comparative scarcity of similar cases in the literature.

Uterus bicornis is not, per se, an unusual or rare condition. Various classifications as to type and origin have been made which do not need further discussion at this time. A search of the literature reveals a comparatively small number of cases which fall under the class in which this case is listed.

Macleau¹ in 1911 reported a case of dysmenorrhea due to hematometra of one horn of a bicornuate uterus. Robinson² also reported a case in that year. In 1912 Oliver³ reported a case. Schwartz⁴ in 1918 reported another case. Subsequently Nemes⁵ reported one in 1921 and in the same year another was contributed by Champel.⁶ From this it may be seen that reported cases of this condition are not abundant.

Case Report.—I. F., a seventeen-year-old Jewish girl was referred from the Medical Department of the Boston Dispensary to the Department of Gynecology for investigation of an abdominal tumor.

Father has cerebrospinal syphilis. One sister in an institution for the feeble-minded. Mother living and well.

Patient born with an anomaly of the right lower extremity, which consisted of a double foot with a single heel, with the main foot in equino varus. The right knee had a deformity, with the knee in 160° of flexion which was maintained by a web extending from the tuberosity of the ischium to the heel. Several operations and manipulations were attempted to correct the deformity but with poor result and two years ago she had the leg amputated above the knee. Has had usual diseases of childhood. Four years ago she had her tonsils and adenoids removed. Three years ago she had an appendectomy for a ruptured appendix. Menarche at fourteen years of age, irregular, occurring every one to five months, duration seven days, using 4 napkins per day. Severe pain was experienced during the entire period.

For the past two years, since her appendectomy, she has been having severe pains in the right lower quadrant. The pain was sharp, intermittent, and localized, starting in the pelvis and radiating up and around to the back. These attacks were often associated with nausea and vomiting. During this time she had noted a swelling of the abdomen. A rounded mass was found filling the lower abdomen and extending to the umbilicus. It felt hard, smooth and somewhat elastic. Pelvic examination revealed a small cervix in back of the mass, and to the left of which there was a smaller mass apparently connected to the larger one, and on top of which a sulcus was found.

A diagnosis was made of ovarian cyst with a possibility of sarcoma.

Operation: Under ether anesthesia midline incision was made. The right pelvis was found to be filled by a cystic mass the size of a grapefruit, with its origin of attachment on the right. The mass was firmly fixed by dense fibrous

adhesions. During the course of freeing the adhesions the tumor ruptured spilling a large quantity of thick chocolate colored fluid. The cyst was removed entirely although not intact. The tube of that side, which had been attached to the tumor, was also removed. A uterus of apparently normal size and consistency was found in midpelvis, in anterior position. The left ovary appeared normal, as did the left tube, but, below the ovary and merging with the tube was a pear-shaped mass about two inches long which seemed to terminate at the junction of the uterine corpus and cervix. A small piece of tissue was excised from the mass for microscopic examination. Following excision a canal was noted traversing the mass and apparently emptying into the utero-cervical canal.

Pathological Report.—Hematosalpinx and hematoecyst of ovary. Chronic salpingitis, perisalpingitis, and periovaritis. Simple cyst, questionable hydatid of tube. Unfortunately the bit of tissue removed from the small mass was lost and no examination obtained.

From our findings we concluded that we had a uterus in normal size and position with an accessory uterus budding out on the left at the junction of the uterine corpus and cervix, merging above with the left tube and ovary.

The patient made an uneventful convalescence. Examination three weeks after discharge from hospital revealed a small uterus in position, with a nontender mass the size of a goose egg, in the right vault. Five weeks later the patient returned to the clinic complaining of severe pain associated with a flow which had started two weeks ago and lasted for one week. The pain persisted even after the period, and was practically constant, sharp, and localized in the right lower quadrant, radiating around to the back, and across the abdomen. Examination now revealed a mass the size of a large orange, occupying the right vault and pushing the fundus to the left. Believing this might be an implantation from the cyst which had been ruptured during the course of its removal at the previous operation, we advised another operation.

Operation.—Under ether the abdomen was opened. The pelvis contained a mass of adhesions involving omentum, intestines, and pelvic organs. After considerable difficulty in freeing the structures a mass was developed which occupied the middle and right portions of the pelvis. This was about 6 inches long and 3 inches wide, hourglass in shape, and attached deep in the long axis of the pelvis. It was firm, and cystic, having a thick wall of what appeared to be muscular tissue. To the left of this was a tube and ovary. The ovary was larger than normal and cystic in character. Below and adherent to the ovary was a pear-shaped mass about two inches long which merged into the larger mass on the anterior left lower pole. Owing to the condition of the patient further investigation was not permissible, and the entire structure was extirpated. No canal was demonstrable when the large mass was cut away, but on removing the smaller, a lumen was found opening into the cervical canal. The patient left the table in moderate shock. Postoperatively the large mass was incised and found to be filled with a thick stringy chocolate-colored fluid.

Pathological Report.—Bicornuate uterus with atresia and hematometra. Chronic pelvic peritonitis. Multiple lutein cysts of ovary.

The patient made a good recovery, and at the time of writing September 14, 1929, which is nine months after operation, she is well and has no complaints. Pelvic examination showed cervical stump high in pelvis and vaults free of masses. Note: Seen March 8, 1930; no pains or discomfort except moderate hot flashes.

The interesting features in this case are the association of congenital anomalies, namely, the double right foot with flexion deformity of the right knee, and the pelvic anomaly. Another feature is the fact that

menstruation took place through the small bud-like uterus on the left side, while the larger atretic horn which occupied the position of the normal uterus apparently did not secrete until the removal of the right tube and ovary, which seemed to stimulate the secretory glands with a resultant hematometra. The occurrence of the large hematocyst which occasioned the first operation is also noteworthy. It would seem from the family history that syphilis may have been an important etiologic factor.

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A CASE OF STATUS EPILEPTICUS FOLLOWING A NORMAL LABOR

BY NORMAN R. KRETZSCHMAR, B.S., M.D., ANN ARBOR, MICH.

Instructor in Obstetrics and Gynecology, University of Michigan

(From the Department of Obstetrics and Gynecology, University of Michigan)

EPILEPSY in relation to menstruation has long been well studied but its relation to pregnancy and labor in general has not been so widely discussed. The subject is important not only from the point of view of the effect of pregnancy on epilepsy and epilepsy on pregnancy but also from the point of view of diagnosis, especially in cases where epilepsy has its onset during pregnancy.

In regard to the relation of pregnancy to epilepsy, it has been observed in several series of cases that there is frequently a definite but not constant effect. Epilepsy in some cases is improved by pregnancy in others the attacks become more frequent and in some the most severe form, status epilepticus or serial epilepsy, has been the result. Nerringler in observing 92 women found that 28 per cent were improved or had a cessation of symptoms while 35 per cent were made definitely worse. Turner states, "There are undoubted cases on record in which fits have been permanently arrested by pregnancy, and others in which a temporary remission has been observed; but it is more common to find a relapse of the attacks, or the conversion of the minor type of the disease into the combined major and minor type." To this, one should add also the conversion to the serial type or status epilepticus or the occurrence of convulsions in rapid succession over a varying period of time.

Jardine in 1907 reported a case of status epilepticus which was fatal to both mother and child and one year later reported another in which the convulsions started before delivery but did not become so frequent

as to be of the serial type until later. The mother died but the child was apparently normal. The patient had a total of 318 attacks over a period of four days.

Waldstein lately has reviewed the literature of this subject and reported a case of status epilepticus. His conclusions in general were that epilepsy rarely has a detrimental effect on pregnancy and gestation seldom makes epilepsy worse. In his case of status epilepticus a cesarean section was done in an effort to save the child. The child lived and was apparently normal but the mother started to have attacks thirty hours after operation which recurred at five to thirteen minute intervals until she died two and one-half days later.

In 17 women with epilepsy observed at the University Hospital there were a total of 28 pregnancies. The findings in this series of cases may be summarized as follows:

11 cases	Pregnancy had no apparent effect on epilepsy in
2 cases	Epilepsy was made definitely worse in
1 case	Epilepsy was definitely improved in
3 cases	Epilepsy had its onset during pregnancy from no other apparent cause in
3 cases	There was a history of definite association of epilepsy with menstruation in
3 cases	

From this small series of cases it is clearly seen that in general, one would expect to find no change in a patient with epilepsy during pregnancy. There were, however, two cases in which the epilepsy had its onset during pregnancy and two which were made definitely worse. This makes a total of four or 24.5 per cent of the above series in which pregnancy was harmful and there was only one case or 5.8 per cent in which any improvement was noted. These figures, although they do not correspond with Nettlinger's, serve to emphasize the same point, that in cases where epilepsy is affected it is more apt to be made worse than it is to be improved.

The differential diagnosis between epilepsy and eclampsia may sometimes be difficult, especially where the epilepsy has its onset during pregnancy. If there is a history of previous convulsions and there is an absence of or only a small quantity of albumin in the urine, and the blood pressure is at or near normal, the diagnosis of epilepsy could be made with relative safety. If, however, the previous history is negative and the onset of the convulsions is fairly late in pregnancy, it is more difficult. The seizures of eclampsia and epilepsy are practically identical in appearance and very frequently the blood pressure is elevated and albumin is present in the urine of epilepticus postpartum. In this type of case the diagnosis must be made largely upon the severity of the albuminuria, the height of the diastolic reading in the blood pressure and on the presence or absence of other findings sug-

gestive of eclampsia, mainly edema. In some cases the final diagnosis may rest entirely upon the subsequent history. Only a very small percentage of the cases of eclampsia have subsequent convulsions while most of the cases of epilepsy reported to have had their onset during pregnancy continue to have seizures for some time after delivery and in subsequent pregnancies.

The treatment of epilepsy during pregnancy is the same as that of epilepsy in general, chiefly the administration of luminal. In cases where status epilepticus develops the treatment is more difficult and much less satisfactory. If the condition develops in the antepartum patient, it gravely endangers the life of the child and for this reason Waldstein believes that cesarean section should be done. In regard to the mother very little benefit has been obtained from anything so far advanced. Drugs seem to have very little effect but luminal by mouth and sodium luminal hypodermically in fairly large doses, that is, up to two grains, seem to be of some benefit in decreasing the convulsions. General anesthesia may help in the same respect. The most important aspect of the treatment is to combat the exhaustion which follows the rapidly repeated convulsions. This may be effected by giving fluids, saline and glucose by hypodermoclysis, by the intravenous route and by rectum. It may be said finally that almost invariably when the serial form of the disease develops, the outcome is fatal regardless of the treatment.

Since it seems desirable to place on record every case of status epilepticus complicated by pregnancy, the following is reported.

The patient, No. 207530, an unmarried woman eighteen years of age, entered the Maternity Ward on Dec. 4, 1928, with a chief complaint of pregnancy with attacks of unconsciousness. There was no history of any organic disease or similar nervous condition in the family.

Patient stated that as a child she was not well but does not remember what diseases she had. She said she had worn glasses since the age of fourteen because her eyes ached but had not been helped much. She had occasional head colds.

Menstruation began at thirteen, regular, of the twenty-eight day type, pain moderate. Last period was in April or May, 1928.

She stated that she had had spells since the age of five. She did not remember anything unusual happening at the onset. From the beginning the attacks first affected her right side, the head turning to the left and jerking to the right. She had no warning of the attacks, which were generally followed by deep sleep. At times she fell during these attacks and sometimes bit her tongue. She was not incontinent during the attacks.

She stammered during her early life and at one time lost her speech entirely for one year. After she recovered her speech she stammered only when excited.

Examination showed a well developed young adult female of normal stature. The patient seemed to be somewhat retarded mentally and reacted slowly to questions and orders. The eyes were negative except for a fine rapid nystagmus on lateral deviation of the eyes. Heart and lungs normal. Blood pressure, 106/70. The abdomen was distended by a pregnancy of about eight months' duration, otherwise negative.

She held the left arm stiff because she said it was painful to move it. On dis-tracting her attention almost a complete range of motion could be obtained with-
out the patient complaining. Reflexes normal.

Urine, normal. Kahn test negative. Vaginal and cervical smears negative for gonorrhoea.

On December 7, the patient became semicomatose and could not be aroused. The condition lasted for about two hours after which she appeared normal but about seven hours later again became semicomatose. This condition was unaccompanied by any twitching or jerking. She was transferred to the Department of Neurology. While on that service 1 gr. of Iminol b.i.d., which the patient had been taking for several years was discontinued. The drowsiness cleared up but epileptic seizures appeared. At one time she had ten within forty-five minutes. After the attacks appeared, she was again placed on Iminol $\frac{1}{2}$ gr. b.i.d., which controlled the attacks.

On January 15, the patient went into labor and was delivered in about five hours of a healthy full-term female child. She sustained a second degree laceration which was immediately repaired. Both mother and baby were in good condition after delivery. At 9:00 p.m. on January 16, sixteen hours after delivery, the patient began having convulsions with both tonic and clonic phases. The convulsions were repeated in rapid succession for one and one-half hours, and she became comatose, and could not be aroused. The systolic blood pressure during the convulsions was 80, the diastolic could not be obtained. A catheterized specimen of urine was negative for albumin. She was given hypodermic injections of Iminol, 1 gr. The coma continued and the next morning January 17, the pulse which had been of good quality and 120 rose rapidly to 180 and became weak and thready. An attempt was made to give intravenous dextrose but without success. An incision was then made and the vein exposed and dextrose solution given (500 c.c.). She was also given caffeine and digitoin but there was no improvement and the patient died at 1:30 p.m.

The child appeared perfectly normal. She showed a normal gain in weight and at no time during her stay in the hospital did she show any evidence of epilepsy.

Fortunately a postmortem was obtained and from Professor A. S. Warthin's detailed report the following abstracted:

In a localized area on each frontal lobe about 3 cm. from the most anterior part there was a thickening of the meninges over an indurated area in the cortex. The cerebrum showed moderate congestion and edema throughout. The gray matter seemed to have proportionately diminished throughout. The anterior part of both lobes appeared definitely atrophied and on palpation seemed slightly firmer than other areas. On the left side beginning just below the longitudinal fissure and about 4 cm. back from the most anterior part of the lobe there was a firm streak extend-
ing down toward the base for about 3 cm. This area of cortex was thinned, much atrophied and there was increased firmness of the white matter beneath it. This suggested a gliosis of very long standing. On the right side in almost exactly the same area the cerebrum presented a similar appearance. Grossly the brain was otherwise negative.

Microscopic Examination.—Brain substance showed atrophy and passive conges-
tion. Areas of atypical gliosis, which were coarse fibred and in part without ganglion cells. Cross-section of the firm linear structure in the cerebrum showed it to be a convolution represented by such atypical gliosis. In part this region showed a very marked edema with liquefaction. Over this region there was a marked thickening of the meninges without phagocytosis of hemosiderin or other evidence of trauma.

Final pathologic diagnosis: "Status epilepticus," localized areas of atrophy in both frontal lobes with gliosis. Bilateral acute purulent bronchitis and bronchopneumonia. Bilateral chronic purulent pyelitis. Cloudy swelling of liver and kidneys. Acute passive congestion and parenchymatous degeneration of all organs. Thymic lymphatic constitution.

Conclusions from this and other cases reported.

1. Pregnancy may be the exciting cause of epilepsy.
2. Pregnancy frequently makes epilepsy more severe and rarely produces status epilepticus or serial epilepsy.
3. The treatment of epilepsy when associated with pregnancy does not differ from the treatment of epilepsy in general except when the condition seems to have been made worse. The patient should be more closely observed and the treatment made more intensive.
4. Status epilepticus in the antepartum patient gravely endangers the life of the child and cesarean section is at times indicated.
5. Status epilepticus is almost invariably fatal to the mother regardless of treatment.

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A thoracopagus with equal development of the parts was born of a primipara, twenty-six years old. The diagnosis was not made even though x-ray pictures had been taken. The monster could not be extracted intact, necessitating evisceration of the first portion presenting, with dismembering of the body and craniotomy. The other individual came out easily after this procedure. The patient's recovery was uneventful.

The author reviews the literature. He believes that when spontaneous delivery is possible the ideal presentation in these cases is 2 footlings. All 4 feet should be brought down, and the breeches extracted in an oblique diameter. The feet should then be brought up as far as possible toward the mother's abdomen in order that the heads fall toward the sacrum. Rupture of the uterus and large tears are the dangers in delivery. Cesarean section should not be performed as the thoracopagus generally dies, either just before or immediately after birth.

FRANK SPIELMAN.

*Read before the Urological Section, Los Angeles County Medical Association, January 8, 1929.

CASE 1.—Mrs. J. W., forty-nine years of age, married twenty-five years, never pregnant, well until five years ago, when she started to have increased menstrual bleeding, frequency in urination, and tenesmus. Her physician found on examination a uterine fibroid the size of a small orange. She was informed, in as much as no organic pathology was found in the bladder, and since the fibroid might have caused the bladder irritability by pressure, that with the removal of the tumor she would be alleviated. Subtotal hysterectomy including the extirpation of both

two characteristic histories.

It is this irritability of the bladder during, or near, the menopause which I wish to discuss. Allow me to illustrate my point by describing as being climacteric.

If these symptoms of the genitourinary group manifest themselves independently in women of this age the etiology is seldom recognized of all other ones.

Outstanding characteristics of climacteric disturbances to the exclusion pronounced, as bladder irritability, or pruritus vaginæ may be the pause. But not infrequently those disturbances which are usually less plants. These are easily recognized to be pathognomic of the menopause. A vasomotor disturbance, or cardiovascular complaint may be outstanding to the exclusion of all others. More commonly it and their respective severity may vary to a great degree. One symptom disturbance. However, the symptoms of the menopause are manifold plants of the menopause, e.g., cardiovascular, vasomotor, menorrhagic is frequently found accompanying the more generally known complaints. As a symptom, bladder irritability I have in mind those cases of bladder irritability which occur in women in, or near, the climacteric. Before the advent of the cystoscope, the diagnosis of bladder irritability was used much more extensively. However, the recognition of organic lesions in the bladder itself, or higher up in the genitourinary tract, by means of this instrument, has reduced the apparent frequency of this condition. The diagnosis, autonomous bladder irritability, should be made only by the process of exclusion, in the absence of any demonstrable pathology of the genitourinary tract or organic nervous system. At the present time the term autonomous bladder irritability or habit frequency is applied by all investigators to those vesical conditions which are of unknown (probably nervous) origin.

I have reason to believe that a certain number of these conditions may be clarified by the recognition of the type of nervous disorder. I have in mind those cases of bladder irritability which occur in women in, or near, the climacteric. As a symptom, bladder irritability is frequently found accompanying the more generally known complaints of the menopause, e.g., cardiovascular, vasomotor, menorrhagic disturbances. However, the symptoms of the menopause are manifold and their respective severity may vary to a great degree. One symptom may be outstanding to the exclusion of all others. More commonly it is a menorrhagic, a vasomotor disturbance, or cardiovascular complaint. These are easily recognized to be pathognomic of the menopause. But not infrequently those disturbances which are usually less pronounced, as bladder irritability, or pruritus vaginæ may be the outstanding characteristics of climacteric disturbances to the exclusion of all other ones.

CLIMACTERIC BLADDER IRRITABILITY*

BY FRED LINDENBERG, M.D., LOS ANGELES, CALIF.

ovaries was done. The operation revealed an intramural fibroid the size of a small orange in the body of the uterus. Following this the bladder disturbances became extremely severe, and frequency occurred about every fifteen to thirty minutes. The patient was referred to me on August 3, 1928. I was informed that since her operation four years ago she was having tenesmus and frequency which has been gradually getting worse so that she had an urgency every fifteen minutes. She had become extremely nervous and has had to retire from social activities entirely. She had been under the care of several different urologists and was told that her condition was merely bladder irritability and habit frequency with no organic lesion anywhere in the genitourinary tract. Palliative measures were used with little relief. Gynecologic examination revealed a firm perineum, a narrow vaginal outlet, a narrow, funnel-like vagina with colpitis granularis, no cystocele and a nulliparous cervix. A small caruncle was found at the external urethra. Urine was clear, slightly acid, specific gravity 1018, and sugar and albumin absent. Cystoscopy revealed a normal picture of the bladder.

In examining this patient it was conspicuous that the vagina had undergone atrophic changes to such a degree as was inconsistent with the age of the patient. It occurred to me that this might have been due to the ovarian deficiency and that the bladder irritability was an atypical symptom of the climacteric syndrome. The patient immediately received whole ovarian extract (2 c.c.) intramuscularly and calcium chloride solution (10 per cent), 5 c.c. intravenously. She noticed an improvement of her condition within two days. She received this treatment twice a week for two months thereafter, gradually discontinued, with simultaneous disappearance of disturbances. Within four months she was free from all symptoms and has resumed her daily duties.

CASE 2.—Mrs. A. E. D., forty years of age, three children, youngest nine years. Her chief complaints were slight bearing down feeling and frequency of urination, every half an hour, of six months' duration. There was no history suggesting bladder infection or other organic vesical pathology. Urinalysis was negative. The cause of her complaint seemed obviously the small cystocele. Anterior and posterior colporrhaphy was performed. This plastic operation had a good anatomical result. However, while the bearing down feeling discontinued, the bladder irritability did not diminish. This patient received ovarian extract and calcium chloride because her age suggested the approach of the menopause. This therapy was followed by a disappearance of her bladder complaints after several injections. The classical symptoms of the menopause occurred in this patient only recently, nearly one year after the beginning of the genitourinary symptoms.

COMMENT

Both patients were in, or near the climacteric age. Their outstanding complaints were frequency and tenesmus. Other climacteric disturbances were absent or not noticeable. Both patients were cured by treating the bladder disturbances as manifestations of the climacteric syndrome.

An explanation of the therapeutic activity in these cases must be based upon an understanding of the pathology of the menopause. The entire picture of the various manifestations of the climacterium is due to one predominant condition, the sympathicotonia. An attempt to explain how this is brought about may be made first, by an interpretation of the endocrine disturbance, and second, by a change of the blood chemistry. With the beginning of the menopause the equilib-

rium of the internal secretions is disturbed by the exclusion of the ovarian hormone. Consequently the antagonistic secretions of the adrenals continue to act uninhibited (unchecked). The adrenals are known to exert a definite stimulative action on the sympathetic nervous system causing the sympathicotonia. The foregoing explanation may be considered theoretic. However, the hormones are the chemical messengers of the body. The disturbance of the endocrine equilibrium is therefore followed by a disorder of the chemical composition. The exclusion of the ovarian hormone is accompanied by a decided drop of the calcium contents of the blood. Calcium is known to have a definite sedative influence upon the nervous system. Therefore, the administration of this drug will undoubtedly have beneficial effects upon the overstimulated sympathetic fibers, replenishing the depleted calcium contents of the blood. Anatomically the unstriped (involuntary) muscle fibers of the urinary bladder as well as the detrusor receive sympathetic innervation. I am unable to explain why in our cases the sympathicotonia was solely confined to the bladder. From a perusal of the urologic literature I have found no mention made of this type of independent bladder disturbance. In papers of Vienna have occasionally interest, however, Werner and Graaf of Vienna have occasionally stressed this point. I submit this paper to the urologists in order that it may stimulate further interest in this question.

SUMMARY

Bladder irritability during the climacteric: (1) is a common disturbance, usually of minor character, among the more conspicuous symptoms. (2) It may be the most outstanding complaint to the exclusion of the more frequent symptoms. Pollakiuria, that is, tenesmus and frequency during this period of female life should suggest the possibility of climacteric character. (3) It may occur with or without a cystocele. (4) In women with cystoceles that have been operated upon, it may continue after the operation in spite of good anatomical results. (5) It is a reflex neurosis of the bladder due to an overstimulation of the sympathetic nervous system (Sympathicotonia). (6) If it is of climacteric character it responds promptly to measures of therapeutic value in the treatment of the menopause, among others, calcium compound and organotherapy.

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Society Transactions

AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS*

FORTY-SECOND ANNUAL MEETING
MEMPHIS, TENNESSEE, SEPTEMBER 16, 17, 18, 1929

THE PRESIDENT, DR. GEORGE VAN AMBER BROWN, OF DETROIT, IS THE CHAIR.

(Continued from March issue)

TUESDAY, SEPTEMBER 17, 1929

DR. E. P. SLOAN, BLOOMINGTON, ILL., read a paper entitled **The Rôle of the Thyroid in Differential Development.** (For original article see page 235, February issue.)

DISCUSSION

DR. ANDRE CROTTI, COLUMBUS, OHIO.—I was hoping that Dr. Sloan would bring to us some facts showing the rôle of the thyroid in uterine development. Of course, this is a very difficult thing to do from the experimental standpoint, so we are thrown back again upon the conclusions from our observations in life concerning thyroid insufficiency. We do not know much about the fetal thyroid. We do know that the thyroid of the fetus goes through three very important changes, but about the actual function of the thyroid in utero we know very little. In fact, we do not know whether it functions at all; we assume it does but from a scientific standpoint we do not know. We believe the mother's thyroid supplies the hormone to that fetus. Consequently, the mother's thyroid has a great deal to do with the development in utero, so in the last analysis, for all practical purposes, we are thrown back upon the mother for the diagnosis of thyroid insufficiency in the newborn. I must confess there is nothing that gives me more difficulty than to diagnose a case of thyroid insufficiency, especially during the first year of life and, as Dr. Sloan has said, it is of the utmost importance that we should make a diagnosis during the first years of life because a great many changes are taking place in the newborn.

There are three cardinal symptoms, so to speak, that might lead one to suspect thyroid insufficiency in the newborn. The first one is overweight; second, the child fails to eat at the proper time; and third, if the child fails to talk at the proper time, it may be supposed that he has thyroid insufficiency. Finally, if the child fails to walk at the proper time. You may find one of those conditions alone but if all conditions are present, you may be almost absolutely sure that you are dealing with a case of thyroid insufficiency.

DR. W. S. BAINBRIDGE, NEW YORK CITY.—A few years ago practically all of our endocrine cases were placed in one of the groups of psychoses and usually stayed there. Today, medical science has advanced to the point where, in many cases, we are able to distinguish between the various psychoses, and we no longer label all the unrecognized types "dementia precox." This has been brought home

*For lack of space, portions of the discussions have been omitted. They may be found in the current volume of the Association's Transactions.

to me very forcibly in my twenty years' work as Consulting Surgeon of Manhattan State Hospital where 7,500 insane inmates are under constant care and observation. The present-day psychiatrist aims to work hand in hand with the clinician and surgeon. The medical profession now knows that an abnormal condition is not always a morbid entity. Sir Berkeley Moynihan, of London, has reminded us that this is an era in which the physician must base his diagnosis on a correlation of the conditions exhibited by the patient. We recognize that mind and body are interdependent organisms and we cannot state precisely the point at which the one affects the other.

Many years ago, the late Dr. Hertoghe, an honorary member of this society and an endocrinologist to whom we owe much of our knowledge concerning the thyroid, said: "If we knew *half* of the function of the thyroid, we should know a vast deal more of the underlying causes of mental and physical ills."

DR. A. J. RONGY, New York City.—I feel that it is quite dangerous for a gynecologist to embark upon the field of psychology. I think that the classification of psychologic reactions based purely on endocrinologic studies is not sound and frequently incorrect. We cannot ascribe the mental status of the morose, criminal, and pervers, to an over- or underdevelopment of the thyroid gland. To associate mental deficiency and criminology with the function of the thyroid gland is not scientifically correct. Human behavior in its broadest sense is not controlled by the secretion of a particular gland. The glands of internal secretion may help to complete a certain type of personality, but I doubt very much whether the mind of the individual is controlled by it. The sum total of human behavior depends upon so many external and internal forces that to attribute it to the glands of internal secretion only is misleading and incorrect.

DR. GORDON K. DICKINSON, Jersey City, N. J.—I have reached the age where conservatism is forced upon me. I have been watching throughout the country the many operations upon the thyroid which is somewhat enlarged. The people write that it is a goiter and they want the neck operated upon. Are they doing these patients any good? What will be the effect in the next ten or twenty years? Will they become senile prematurely? I have asked this question of specialists and have received no answer. I would like to ask Dr. Sloan whether he has any statistics by which he could tell us whether we are doing the proper thing in operating upon such patients in the adolescent age simply because the neck is somewhat enlarged?

DR. SLOAN (closing).—I did not wish to infer that the thyroid disturbances were causing these mental defects and aberrations, but it is the lack of differential development brought about by lack of thyroid efficiency in the mother and in the young child that is bringing these things about, and I think very abundant proof of that is found all over this country. In one home for the feeble-minded in our State there are 42 families represented. The older members of those families are in the institution but the younger children, due to thyroid medication in the mother and in the young children, are fairly normal. We see these things frequently. I recently made a survey of a home for the feeble-minded containing 3600 children. Taking out the real cretins and anomalies of various types, there were over 1300 children that the doctors were taking care of, whom they feel could have been saved by early attention to differential development.

I do not mean to say that the thyroid is the whole cause but I do think it is the major cause. However, the greatest problem is in the great percentage of children in our schools who are abnormal. We are living in a super-normal world today. These people would get along all right in previous generations, or even

fifteen or twenty years ago, but now they fall by the wayside. Every citizen should have his differential development brought up to his inherent possibilities and we must recognize the fact that we have an obligation to this generation in at least considering and thinking of defects in differential development, and considering these questions at a time when something can be done.

DR. J. F. BALDWIN, COLUMBUS, OHIO, read a paper entitled *The Surgical Treatment of Certain Puerperal Infections*. (For original article see page 219, February issue.)

DISCUSSION

DR. JOHN OSBORN POLAK, BROOKLYN, N. Y.—In the first place let us have a very clear understanding as to this puerperal problem. There are two common types of infection postpartum, and in this I am sure Dr. Baldwin will agree with me. One begins as an endometritis, a uterus with poor retraction and extends through the lymphatics to the parametrium or begins with a cervical injury which extends into the parametrium and produces a parametritis, an exudate which usually organizes and in which every one who has had any experience in this class of case, including the distinguished essayist, knows that surgery is contraindicated except in abscess formation.

The other class begins as an endometritis and probably is not infrequently caused by those anaerobic bacteria which Dr. Schwarz called to our attention. It is followed by a thrombophlebitis and lymphangitis. We all find the uterus studded with small thrombi and each focus is surrounded by small round cell infiltration and polymorphonuclear cells, an attempt to prevent extension. This is nature's effort to localize the infection and nature is competent to do it if she has time and the patient is responsive and the infection is not too virulent.

There is, however no question that there is a limited class, which I am convinced can be cured by timely removal of the uterus. The point that Dr. Baldwin brought out is one that should be emphasized. These patients are entitled to an accurate diagnosis. For nearly twenty years, before we took up the absolutely conservative plan of management, I was in charge of a ward with 38 beds, filled with puerperal and postabortal infections. We examined these cases twice a week and charted the findings. We noted that it was the postabortal cases which produced the peritonitis and the tubal extensions. We found that the postpartum cases always, or at least in the majority of instances, had endometritis, parametritis, or thrombophlebitis. Parametritis was most frequent in the puerperal case, peritonitis and salpingitis in the abortion cases. When the bacteria get beyond the focus of infection into the blood stream, there is no operation which will remove them.

The treatment hinges upon diagnosis and the time at which the diagnosis is made. Endometritis, septic or necrotic, with metrothrombophlebitis confined to the uterus, with no blood stream infection, should give good results from extirpation, but I have not yet determined how to make this diagnosis, or when to operate, because the physical findings show us nothing except a subinvolution of the uterus and a sick patient. When we find masses in the parametrium, it is not the time to operate. When we find masses in the tube, operation is admissible, but fortunately this is rare.

Dr. Baldwin has convinced me that a deeper study of the subject and of the individual case will improve results. I have been able in the last year to operate upon two patients such as Dr. Baldwin speaks of, and I think that both of these women would have died had I not operated. And yet some of the cases that Dr. Baldwin has reported I am convinced I would never have operated upon the patient

because of the immense parametrial lesion that was present. Our experience has been that when we get into this new tissue that has been thrown out for the purpose of protection, the hemostasis is so difficult to control that the patients are traumatized and if they do not die are very sick, unless we could do a very rapid procedure and most men cannot operate with the same rapidity as the essayist, removing the uterus in eighteen minutes with a technique such as Dr. Baldwin uses. I know I cannot. If I get through in thirty minutes I think I am doing exceptionally well.

What I want to leave with you is that before accepting any form of treatment in puerperal infection one must accurately determine the existing pathology. Do not be beggled by the fact that some cases of metrorrhombolitis get well by hysterectomy. Some will get well by supportive treatment, as was shown in our reported series last year of 63 cases with 21 deaths.

DR. OTTO H. SCHWARZ, Sr. LOUIS, Mo.—Dr. Baldwin's paper has a great tendency to convince one that certain types of puerperal infection, particularly the cases of pyemia which develop from a pelvic thrombolitis, and ordinarily have a mortality rate of over 70 per cent, require surgery, and that surgery seems to be their only hope in the present state of our knowledge concerning these infections. Most patients who should be benefited by surgery are of the thrombolitic type. I believe that the greatest good comes in these cases, not from the actual removal of the uterus, but rather by taking care of the thrombotic veins either by ligation or according to the method that Dr. Baldwin has outlined in a previous paper. These cases of thrombolitis are almost in all instances due to anaerobic streptococci and a diagnosis of the offending organism should be made in every case before radical measures are instituted, if this is possible. If the patient has a rise of temperature for two or three days, we think it is a good policy to culture the uterine cavity to check these findings, should subsequent blood cultures recover organisms from the blood stream. Should there remain at the time of culture any material in the uterine cavity, this should be removed by the use of an ovum forceps, sponge stick, or dull instrument, and an antiseptic douche given under low pressure. As we have stated before, anaerobic organisms are the chief offenders in thrombolitis. They are not like ordinary pyogenic organisms, such as the hemolytic streptococci or various types of staphylococci, but are harbored in many instances by the patient herself. The prevention of these anaerobic infections therefore, is in my opinion, one of the greatest problems that we have to deal with in regard to puerperal infection.

DR. GEORGE F. PENDLETON, KANSAS CITY, Mo.—There are five different clinical types of puerperal infection: infection within the uterine cavity, localized pus somewhere in the pelvis, peritonitis, straight septicemia, and thrombolitis. In septicemia the bacteria are probably so virulent that they do not allow thrombi formation. At autopsy we do not find anything; nothing on the heart valves, no focus in the lungs, perhaps one small focus in the liver or kidney but generally not even that one. The other type, thrombolitis, at autopsy we can cut through the broad ligament anywhere and squeeze out numerous thrombi from the venous channels. One can dissect up the broad ligament and find them in the spermatic veins even to the vena caval junction.

I would not classify Dr. Baldwin's cases true thrombolitis nor septicemia but rather those of localized pus in the pelvis. In the real thrombolitic type nothing is felt in the pelvis. The uterus is mobile, the broad ligament feels only slightly thickened, perhaps a little tender but very often not, but the patient is sick with chills and irregular temperature and pulse curves and has neither abdominal tenderness nor rigidity.

Treating a patient expectantly is the best plan from the standpoint of septicemia. When treating a thrombophlebitis likewise many do get well but for obvious reasons we know a certain small number will not live. Show us some differentiating point between these two subtypes so that we can tell which patient needs surgery. So far Dr. Otto Schwarz has offered us the only clue in his anaerobic blood cultures. Pus in the pelvis should be drained and if necessary drain or remove an infected uterine wall, but that will not save a true thrombophlebitis. In the latter case we must ligate the internal iliac veins as well as the spermatic veins as high up as possible. To date the expectant plan of treatment offers one a much lower mortality than the surgical intervention as evidenced by the reports of Dr. C. Jeff Miller and others.

DR. W. CHANNING BARRETT, CHICAGO, ILL.—Several years ago when these reports came out one of the not least conservative men in Chicago very quickly reported seven cases of hysterectomy for puerperal infection that he felt sure would have died if the operation had not been performed, and all of them recovered after the operation. I was dealing with considerable puerperal infection at the County Hospital at that time and I said in discussing that paper, that I found it very difficult to diagnose a condition in the uterus which indicates that the patient is surely going to die without a hysterectomy and will recover 100 per cent with a hysterectomy. Hysterectomies in those cases are too dangerous. We all meet with cases of puerperal infection, and we can remember some of the worst ones when we were not at all sure would recover without a hysterectomy, and inside of a year after they have given birth to living children. We see many of such patients who have their functions preserved by conservative treatment, so that not all patients who are seemingly desperately ill with puerperal infection are positively going to die if treated conservatively.

DR. J. P. GREENHILL, CHICAGO, ILL.—I should like to contradict the statement made by Dr. Baldwin that 100 per cent of patients who have sepsis die and that therefore surgical therapy is indicated. Dr. Polak's remarks indicate that there are others who believe that conservative treatment is the correct one for puerperal sepsis.

It may be of interest to see what one large maternity hospital has accomplished with the most conservative treatment of sepsis. At the Chicago Lying-in Hospital, in a series of 23,136 cases, there were 57 maternal deaths, a mortality of 0.246 per cent or 24.6 deaths per 10,000 births. Among these 57 deaths were, 3 due to sepsis, 4 to peritonitis, and 5 to embolus. Since we believe that nearly every patient who has an embolus after delivery has an infection somewhere in the body at the same time or has had a recent infection, we have a total of 12 patients who died as the result of infection after childbirth. There were three cases of puerperal septicemia but only one of these patients was delivered in the hospital. The other two were sent to the hospital after delivery. The Chicago Lying-in Hospital is like many large institutions where large numbers of patients are admitted after having been mishandled in their homes. We have a separate isolation building for infected patients and it is kept filled most of the time. In spite of the larger number of patients with sepsis which have been cared for at our hospital in the series of 23,136 cases, there were only 12 deaths which could be attributed to infection. This includes all the deaths even those due to cesarean section. Our treatment of puerperal sepsis is as conservative as can possibly be. What we attempt to do is build up the patient's resistance by an abundance of fluid, good food, sunshine, fresh air, tonics and repeated, small, blood transfusions. We believe our results justify the continuation of our conservative therapy; for if this form of treatment had not been effective we would have had many more deaths from sepsis than we did have.

DR. A. M. MENDENHALL, INDIANAPOLIS, IND.—I became an enthusiast several years ago in the use of mieroerthrome and fell a victim to what I am fearful Dr. Baldwin did and that is in selecting the cases which I felt would surely die. A number of my patients to whom I had given mieroerthrome got well, but in a very careful analysis, would not some or all of them have gotten well if they had never had any mieroerthrome? We see some violently ill cases of puerperal sepsis recover. If Dr. Baldwin has something which will improve our statistics then I am sure that I want it, but that is the problem I am presenting to him, to enable us if possible to ascertain what cases will recover if not operated upon.

As to the blood stream infections, possibly his reports show these, but we feel perfectly sure that if there is a bacteremia a hysterectomy is not going to give very much better results than using the conservative procedures. If there is bacteremia I believe that it should be recognized and be a pretty definite contra-indication to such major surgery.

Then Dr. Barrett brought out the fact that if it goes out from this Association that we have halfheartedly approved of major surgery in puerperal sepsis, I fear many surgeons doing obstetrics will begin doing hysterectomy and have a very unnecessary high mortality. Dr. Polak and others in favor of conservative treatment know that we can save a lot of these patients by treating them conservatively, but if hysterectomy is rushed into and sanctioned by this society, I am sure the result would be that the surgeons who are called in for ordinary puerperal sepsis, and without the ability to diagnose these cases that Dr. Baldwin has, would increase the mortality rather than decrease it.

DR. S. J. GOODMAN, COLUMBUS, OHIO.—It has been said that 'example is much better than precept' and having been in a position to see Dr. Baldwin's work for many years in regard to this particular technique, I believe that he is absolutely sincere, and that he has really obtained the results that he speaks of. To say that it is wrong to believe him because the dictum might go out from this Association and that every surgeon would be doing a hysterectomy for every case of puerperal sepsis would be just foolish as to say that we should not approve of cesarean section because we know that in the State of Massachusetts one woman in every 27 is cesareanized.

Dr. Baldwin and I can get a large crowd at our local Society any time we wish when he comes up to talk about his technique and I talk on the conservative side of puerperal sepsis. But if you would take into consideration that Dr. Baldwin is talking about one certain type of case which he can diagnose you would understand him. Frankly I cannot make a diagnosis in all such cases and I seek his assistance but that is no reason to belittle his technique. The thing to do is to come to Columbus and take a few lessons from him, and then many of you will be more able to diagnose the particular type of case in which this technique is indicated.

Some years ago I heard Dr. Schwarz say that he believed in the curette and the uterine douche. Such men as Dr. Findley were very much amazed that any man should speak in that day and age about the curette and douche in the treatment of sepsis and infected uterus. Again I am surprised to think that any one would suggest the use of a curette or the use of an intravaginal douche in puerperal sepsis.

DR. E. J. ILL, NEWARK, N. J.—It was not my intention to talk on this subject but I have been able to follow Dr. Baldwin's work and have the highest regard for what he is doing. I believe most of the patients would have died if he had not operated upon them. Those of us who have seen him operate know the reason for this. His gentleness, accuracy, and celerity without hastiness explains that.

If we accept Dr. Baldwin's advice we shall be confronted with the most difficult task to say which case offers a hope by operation and which case will recover by operation. Dr. Baldwin's perseverance in this work is exceedingly commendable. An experience presenting twenty years in this work certainly deserves our earnest consideration. While I believe many of us will fail to do as well as he, it will be because we have waited too long.

The operative technic as explained needs careful study, and if we are to have any good results, it should be carried out to the letter. Dr. Baldwin has spent much time and study on his work and those of us who wish to follow him must not experiment with their cases.

DR. OTTO H. SCHWARZ, St. Louis, Mo.—Dr. Goodman states that he is horrified at the use of the curette. I tried to make it clear in Chicago several years ago that we do not use a sharp curette. We dilate the cervix, use a sponge stick or ovum forceps to remove any material that may be found in the uterine cavity, and go over the cavity with a dull instrument afterward without breaking up nature's so-called protective barriers. In removing this material and establishing drainage, there is in my opinion less chance for the development of infection, particularly that of the anaerobic type. Instituting this treatment comparatively early would in my opinion avoid many of the conditions for which Dr. Baldwin is later operating.

DR. BALDWIN (closing).—I wish to call attention to the fact that simply because a blood stream infection is reported does not mean that the patient will necessarily die, and if the pelvic conditions are such as to indicate operative procedure, she should not be refused that chance.

I am very glad to hear that two stars have been added to my crown of glory by Dr. Polak, in his statement that he has successfully operated upon two of these patients which without operation would have died.

Three days ago I operated upon one of these patients, which presented a temperature the evening before operation of 108° following a chill; the highest temperature I have ever seen. I did a hysterectomy and she was doing nicely when I left home. (This patient made a perfect recovery, and the laboratory reported that the walls of the uterus showed multiple abscesses.)

DR. JAMES E. DAVIS, Ann Arbor, Michigan, read a paper entitled **A Critical Study of 335 Hysterectomies.** (For original article see page 246, February issue.)

DISCUSSION

DR. JOHN O. POLAK, BROOKLYN, N. Y.—It is amazing to find in reviewing several thousand histories, the extent of the mortality and morbidity and the number of defective histories. Dr. Davis has brought out that preoperative study even in this twentieth century is not carried out on the principles of the basic principle of group medicine. A mortality of 4.6 per cent in a series of 335 hysterectomies is an extremely high death rate for elective procedures, just about three times what it ought to be. Dr. Davis shows that it is because of the lack of preoperative study and the varying technical skill of the several operators. We have no right to operate upon the elective case without proper preparation of the patient. This means not only should we know the kidney function, the cardiac force, the condition of the lungs, of the patient's blood, but should use the laboratory and diagnostic aids we have at our disposal. What is the use of doing an operation for body carcinoma unless we have previously had an x-ray of the lungs? Why should we remove a breast before first having an x-ray of the chest in order to know whether there has been an extension?

Another point: Patients are good or bad risks where certain anesthetics are concerned. The condition of the blood is a dominant factor. Take the woman with a fibroid who has a hemoglobin of 30; we transfuse her and the hemoglobin goes to 40; again transfuse her and it goes to 50. She is not as good a surgical risk as if she had had a hemoglobin of 50 to start with. If we operate immediately after the transfusion we do not get as good an effect as if we wait a week or two. The anesthetic does something to the biochemistry of the blood and we get a result that we would not get otherwise.

A large number of these cases showed infection about the cervix. I am fully in accord with Dr. Baldwin that panhysterectomy is the best thing for the patient in a very large majority of instances. Dr. Baldwin says in all cases, but I cannot say that because I cannot get the cervix out as fast as he can. Panhysterectomy is advisable in many cases because of the incidence of cancer. We found an incidence of 1 to 2 per cent of cancer in the cervix of fibroids removed by hysterectomy. Here is the point: Those cervixes remain as constant foci of infection and these patients are not cured because of the parametrial infection which results from the cervical condition.

Dr. Davis stated that a large number of these cases showed that the cancer tissue was cut through; this was due to lack of surgical skill or faulty selection of cases. It does the patient more harm to have an incomplete operation for cancer than no operation at all.

DR. II. W. KOSLMAYER, New Orleans, La.—I recently reviewed the records for five years at the State Hospital in New Orleans, and a comparison of panhysterectomy and supravaginal hysterectomy led to the belief that the ultimate death rate of the two procedures is pretty close because, if you add the usual hysterectomy death rate up to about the same as the primary death rate in panhysterectomy. If this be the case it is perhaps better to give the woman an interval of health and usefulness after supravaginal hysterectomy and let her ultimately die of cancer of the cervix, in addition to the fact that we do spare surgery the ones of the death. The death rates appear to be quite close according to the statistics all over the country.

Dr. Davis mentioned various disturbances in the preoperative findings. We have observed a fairly constant hypertension associated with large fibroids, which is relieved by removal of the fibroid. I say we believe, because these colored women with whom we are dealing cannot be kept track of. Therefore we do not know how long the immediate lowering of blood pressure continues. But frequently, when they leave the hospital, their blood pressure of 210 systolic will be down to 140 following removal of a large fibroid. According to the recent finding of organisms in the walls of myomas, it might be toxic in origin rather than a mechanical pressure.

DR. WALTER T. DANNBREUTHER, New York City.—One pertinent point suggested by Dr. Davis' premises is that, just as in the therapy of carcinoma of the cervix, the man who decides what shall be done with a fibroma should be one who is a competent pelvic surgeon, has an adequate amount of radium at his disposal, and has both high and low voltage x-ray therapy facilities. Only then will his judgment be unbiased. Personally, after a reasonably wide experience with all three therapeutic methods, I am of the opinion that x-ray has practically no place in the curative treatment of fibroids, although it is often of value in arresting hemorrhage from large tumors before operation.

It has always seemed logical to classify uterine fibroids in two groups: those causing hemorrhage and those causing pressure symptoms. There is little that can

be done for the bleeding tumors with x-ray that cannot be done equally as well or better with radium, and the damage to the ovarian function with an appropriate dose of radium will be far less than with x-ray. In the case of very large bleeding fibroids, where it is obvious that radium therapy would be ineffective because the margins of the tumor extend so far beyond that 10 cm. which we expect the gamma ray to penetrate, operation rather than radiation is indicated. I am confident that hysterectomy is the preferable method of treatment for fibroids causing pressure symptoms.

It is unfortunate, but true, that patients are still being treated with x-ray or radium, particularly by those who are not gynecologists, without preliminary curettage to establish a definite diagnosis before radiation. We do a curettage, not because we expect it to be of the therapeutic value, but because we can sometimes recognize carcinomatous tissue when it comes away with the curette, and we thereby secure endometrial scrapings for microscopic diagnosis.

DR. WILLARD R. COOKE, GALVESTON, TEXAS.—As regards preoperative preparation to determine whether a patient is fit or unfit for operation, a few years ago I put into effect in our hospital a few very simple rules. Before that time we were having a laparotomy mortality of from 5 to 7 per cent; and we were able to reduce that to 0.82 per cent in the laparotomies in which all the rules had been faithfully observed. The most important of these rules is the complete and careful examination of the patient, with appropriate consultations when indicated.

Regarding the question of removal of the cervix, two things should be taken into account. The first is the individual skill of the operator. Certainly the ordinary operator will not be able to approximate his mortality for supravaginal hysterectomy in doing complete hysterectomies. He might better do the supravaginal hysterectomy, and then, if the cervix continued to show symptoms of disease, or if there were signs of pathologic changes, remove the cervix as a second stage operation, the latter operation being easy and practically without mortality.

The other point is that there is a great deal of difference in the incidence of cancer in the cervical stump in different localities. Why that is so I do not know. Having many fibromyomas in the South, we do many supravaginal hysterectomies; yet we have encountered only one case of carcinoma in the stump, that being in a patient operated upon in Philadelphia. I should say, at a rough estimate, that some 3,000 supravaginal hysterectomies have been performed by members of our staff; yet in none of these cases have we observed the subsequent development of carcinoma in the cervical stump.

DR. A. J. RONGY, NEW YORK CITY.—In my experience the incidence of malignancy in the cervical stump following supravaginal hysterectomy is very rare. I believe that, as a general proposition, a patient in the hands of the average surgeon is safer when a supravaginal hysterectomy is performed than a total hysterectomy. The mortality in supravaginal hysterectomy is about 4.5 per cent. If we advocate total hysterectomy I am certain the mortality will be double.

In uncomplicated cases I perform a supravaginal hysterectomy and help reduce the possible occurrence of malignancy in the stump subsequently by cauterizing the cervix from above. In that way all the glandular tissue of the cervix is destroyed and therefore the incidence of malignancy will be reduced. It also helps to cure the leucorrhœal discharge which many of these patients have. In many cases the cervical stump helps to support the roof of the vagina, thus preventing prolapse of the vaginal vault later on.

DR. W. C. BARRETT, CHICAGO, ILL.—This report indicates altogether too high a mortality for fibroids. It should be less than that given. A man that undertakes

to do surgical work on difficult hydroids should be a more careful operator than to get a mortality like that in the average cases.

There is perhaps no one kind of operation that is best for all cases because in certain cases myomectomy would be the operation of choice as it rids the organism of the fibroid and preserves the organs. There are classes of cases where we might remove the fibroid and preserve the physiologic functions of the uterus. In some cases the body of the uterus could be removed and still enough of the uterus left for menstruation and the patient has the feeling that she is like other people.

DR. J. F. BALDWIN, COLUMBUS, O.—I have advocated for a number of years the total removal of the uterus in making hysterectomies. Nearly twenty years ago I operated upon a virgin school-teacher for a mass of fibroids, and I left the cervix. A few years later she was happily married, but about a year ago she wrote me that she was having a bloody discharge. She was found to have an inoperable cancer of the cervix which was treated with radium.

Two months ago I had a patient come to me who had been operated upon by the supravaginal method by an operator with considerable experience, but he left the cervix. She had at that time developed a cancer of the cervix after the lapse of about ten years. I made a thorough removal of the cervix through the vagina, but the end-result is for the future to determine.

Dr. Polak honored me some years ago by witnessing three panhysterectomies one morning, and he wrote me complimenting my technique. The additional danger, if the cervix is removed by the proper technique, is so slight, while the danger of cancer is so great, that it seems to me that we should do the woman the justice of the complete operation. I have now personal records of 33 cases in which cancer has developed in the cervix thus left. We cannot compare the death of a woman in two or three days from abdominal operation with the horrible death from cancer. Numerically large statistics may show that as many patients die from the complete operation, who would not have died if the cervix had been left, as will die of cancer because of leaving the cervix; but there is a vast difference in the amount of suffering which the two classes will undergo. In practically all cases, therefore, at the hands of a skillful operator the complete removal should be performed.

DRS. E. J. ILL, J. W. KENNEDY, AND W. C. BARRETT also participated in the discussion of this paper.

DR. DAVIS (closing).—I would like to make this point clear so that no one will make any mistake about the data studied: This study represents a given cross-section of work being done in America in a representative city of about a million and a half population and the paper contains a report of the work as done there. When compared with some of the results as reported to me by forty-five leading operators of this country I am glad to say that a considerable percentage of the forty-five operators are following exactly the same practice as in Detroit. If Fellows of this association who are leaders think that because their statistics are excellent, that they represent the results that many other operators are getting, they are certainly wrong. I feel that success in surgery depends in no small way upon the missionary work, or the help that leaders can give to others who are operators doing a large amount of this type of work. Of course, it is quite unfair to compare the results of thirty or more operators with the results of one single operator, but I would like to challenge anyone to take a similar cross-section from any other city in the Union and show any better results. I hope that our distinguished guests from Europe will not misunderstand. This report does not represent more than a fair cross-section of average surgical work as done in a large American city in different hospitals and by more than thirty operators. It is an

honest, exact statement from the records studied in these hospitals. My opinions are not materially concerned. It is a faithful setting down of the record as found. For that reason I believe it is worth while noting the results as obtained and how they were obtained.

DR. G. VAN AMBER BROWN, Detroit, Mich., read the president's annual address, entitled **Recent Important Advances in Obstetrics and Gynecology**. (For original article see page 153, February issue.)

TUESDAY AFTERNOON SESSION, SEPTEMBER 17, 1929

DR. W. S. BAINBRIDGE, New York, N. Y., read a paper entitled **Non-malignant Breast Conditions, Diagnosis and Treatment**. (For original article see page 255, February issue.)

DISCUSSION

DR. W. W. BABCOCK, PHILADELPHIA, PA.—The tendency has been, I believe, to overemphasize the frequency of carcinoma in the breast. No one minimizes the importance of recognizing carcinoma, but carcinoma is not the most common condition that afflicts the mammary gland. If we have been taught that 86 per cent of the tumors in the breast are cancer we should remember that this does not mean that 86 per cent of all the lumps that appear in the breast are cancer. Indeed, a very large proportion of patients with a lump in the breast do not have cancer. I consider it poor psychology and poor propaganda when we beseech the public, "have the lump examined, it probably is cancer." The patient should come for an early examination expecting relief of mind, "it probably is *not* cancer," rather than delay in fear of being doomed to a lingering, torturing death. We should not say, "have the breast examined, it may have to be cut off," but rather "have the breast examined, it probably can be saved."

The question of diagnosis I would sum up very briefly in this way: A tumor or a lump in the breast may be localized; it may be sharply contoured. If it is both localized and sharply contoured, it is probably benign. If sharply localized and poorly contoured, it usually is a carcinoma. A tumor in the breast may be both indefinitely localized and poorly contoured, in which case it probably is an inflammatory condition, such as a lobar type of mastitis. Of the localized, sharply contoured lumps, the so-called "blue dome cyst" deserves especial attention. At a glance you note that it pushes the skin out, while a scirrhus pulls the overlying skin in. Let us forget, if we will, the retraction of the nipple which comes later and remember that the earliest, most characteristic sign of a cancer of the breast is the slight flattening or depression of the overlying skin best seen by oblique illumination. This sign is almost pathognomonic. We should also remember that few of the chronic inflammatory conditions of the breast really lead to carcinoma. The blue dome cysts have aroused a great deal of discussion of late years but I think the experience of those who have let the cysts alone, or simply have aspirated them, agrees with that of Bloodgood, that they seldom refill or progress to carcinoma. At the same time we must be absolutely sure of our diagnosis, and this may require exploratory incision. Let us remember, also, that we should never explore unless we are prepared instantly to remove the breast should the condition prove to be cancerous.

DR. GEORGE F. CHANDLER, KINGSTON, N. Y.—I regard this paper more suited to men who are expert diagnosticians. I believe the Doctor forgets that the majority of these cases come to the general practitioner first.

Dr. Bainbridge stated that some of the Doctors who send their patients to surgeons to have the breast removed immediately were eowardly. Well, if that is so, we have a great many heroes around my part of the country because the cases we usually have sent to us are absolutely carcinoma of the breast when they reach us. So I think that there are two sides to this question and I would rather err on the side of radical surgery. Dr. Bainbridge operates upon these patients by doing a plastic operation. While I am not capable of doing a good plastic operation upon the breast, I think a fine scar when the breast has been removed looks better than a mutilated breast. Also to leave a scar in the breast is not a good thing.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—In this country three terms have been pretty well standardized in referring to constitutional development: one, the genotype; second, the paratype; and third, the thecotype. Applying this to the subject under discussion very much information can be obtained in regard to the likelihood of a breast becoming malignant or being benign by studying the mother and the grandmother of the patient, ascertaining whether there is a tendency in the family to very early abortive changes, ascertaining just what are the changes at the menstrual period in the mammary gland. As to the paratype data, there should be a careful history as to the trauma sustained during life; in other words, the conditions that the patient has gone through either in the exigencies of nursing, infections, etc. Then the last type, which is the sum total of all that has gone before, representing the patient's reaction to all that he or she has had to contend with either from heredity or environment as presented in the up-to-the-minute final adjustments when presented as a diagnostic problem.

DR. BAINBRIDGE (closing).—The key to the situation has been stated by Dr. Babcock. We must not presuppose every breast condition to be malignant. We should examine the whole field of possibilities when making a diagnosis in mammary gland pathology.

Dr. Chandler misunderstood me. I said that a surgeon is a coward if he is not willing to assume the responsibility of his diagnosis. Dr. Chandler said he would feel better should a relative of his with a lump in the breast have that breast removed. The question is how would the patient feel if the laboratory reported the breast "nonmalignant." The patient alone is the one to be considered. It should be the patient first, last, and all the time. I have a patient in whom both breasts had been removed elsewhere. There was no necessity for the operation. It was a clear case of intestinal toxemia.

Perhaps I can reply better to this discussion by reading the latter part of my paper which I did not have time to read. "In spite of the classical descriptions, I have encountered many fibroadenomas associated with retraction (congenital) of the nipple. I have found them accompanied by glandular enlargements of inflammatory nature; of single and multiple growth. I have examined many adenomas which have been of slow growth and which, upon frozen section, have revealed a beginning malignancy and others which have grown with great rapidity and have proved, upon section, to be of purely benign pathology. Some have been as small as hazelnuts; others as large as oranges. These contrasts are merely stated to indicate that we dare not make a final diagnosis of any breast lesion based alone upon the usual classical descriptions of such a tumor. Clinical experience must be largely our guide."

When the most radical surgery is indicated, there should be no hesitation in employing it immediately; in doubtful cases there should be critical investigation and in every nonmalignant tumor of the human breast, the surgeon should aim toward the preservation and conservation of the mammary gland.

PROFESSOR R. W. JOHNSTONE, Edinburgh, Scotland, delivered, by invitation, the second Joseph Price Foundation Lecture, entitled **The New Physiology of Menstruation and Its Practical Implication in Obstetrics and Gynecology**. (For original article see page 167, February issue.)

DR. Q. U. NEWELL, St. Louis, Mo. (Guest), read a paper entitled **The Time of Ovulation in the Menstrual Cycle as Checked by the Recovery of Ova from the Fallopian Tubes**. (For original article see page 180, February issue.)

DISCUSSION

DR. OTTO H. SCHWARZ, St. Louis, Mo.—Dr. Newell is to be congratulated upon the very ingenious method of recovering these ova. As he has stated, the method is very simple and apparently in his hands is without ill effects. It has value in other ways, as he pointed out; for instance in doing plastic work on the tubes to see whether patency actually exists. Of course, the thing that will probably come out of this work is that sooner or later he will recover an early impregnated ovum.

Recovering such an ovum while it is in transit in the tube, should definitely settle the point as to whether the human ovum behaves similar to the guinea pig ovum as is now credited. As Dr. Newell is operating upon these patients soon after ovulation has supposedly occurred, he should be able to make definite observations as regards the character of the early corpus luteum, particularly in regard to whether it is usually found in the collapsed state or filled with blood.

DR. NEWELL (closing).—In performing research work we expect to work a long time before finding the things we are searching for, but in this piece of work we were successful in finding the nine unfertilized ova in a comparatively short time. However, we did spend much time in searching for an early fertilized ovum without any success and are continuing our search for such a specimen.

Replying to Dr. Schwarz's question, will say we have sections of all the corpora lutea corresponding to the nine unfertilized ova and they all show the normal characteristics of early formation.

WEDNESDAY, SEPTEMBER, 18, 1929, MORNING SESSION

DR. W. T. DANNREUTHER, New York, N. Y., read a paper entitled **The Teaching of Postgraduate Gynecology**. (For original article see page 241, February issue.)

DISCUSSION

DR. H. W. KOSTMAYER, NEW ORLEANS, LA.—For a good many years we have offered two types of courses in Tulane University, New Orleans, the one a short review course to the busy practitioner who wants to brush up on some of his work, and the other a three-year course leading to an advanced degree.

It is a striking thing to me to contrast the figures of Dr. Dannreuther's institution and our much smaller one, not so much in total figures as in percentage. Approximately they are as follows: For the last four years at Tulane Postgraduate School there have been something less than 700 matriculates and during those four years only thirteen interested in gynecology combined with other subjects and only five who specified a course in gynecology alone. At New Orleans we have something that it seems to me would attract the graduate who desires to brush up on his work,

as well as the general practitioner who perhaps has to do a certain amount of that work, and that is the abundance of material for pelvic examination. Instead of representing these examinations, these colored women feel that they are being given a great deal more attention when five or six are permitted to make these examinations. We offer the graduate coming there for work in these short courses an opportunity to examine the patients who will be operated upon in the next few days so that he can go into the operating room and follow his own and our diagnoses. In spite of that, we have had only five men matriculate in gynecology. It seems difficult to explain.

One point especially that I was very agreeably impressed with was the merging by Dr. Dannreuther of the divorcement of gynecology from general surgery. We have them permanently divorced at Tulane although one never knows when they will re-marry. I have some doubts about the advisability of combining gynecology and obstetrics under one head with very distinct subheads. Perhaps one general director might be advantageous, but we have separated the two Chairs completely in the Postgraduate School of Medicine.

I have been urging that the doctors wherever practicable be made to matriculate in the Postgraduate School, and I hope that sometime we may have this in effect at Tulane. I believe that if interns were compelled to matriculate in the Postgraduate School of Medicine and had certain assigned duties and lectures during the year by the Faculty of the Medical School it would produce much better interns.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—I am convinced that this is one of the most important subjects that can come before this organization or any other for discussion. It is a very peculiar attitude of mind to think that a man's education ends when the undergraduate school has finished giving its instructions. Economically it would seem all wrong to prepare a man for a life period of work in the community by ending all obligations at the end of the fourth year. The colleges are spending great sums of money to take care of the undergraduate work but are doing almost nothing toward meeting the obligation for the continuation of education from the period of closing the undergraduate study. It seems to me that we are all obligated to teach our communities, to teach those who go to the legislatures for appointments that there is a great need of continuing the educational opportunities for men who are engaged in the practice of medicine. The plan should be so broad as to take care of all of the needs of all of our practitioners. This means the expenditure of a great deal of money. It requires some very careful planning that has not yet been completed throughout this country to the extent or with the success that is desired. We have in Michigan a newly instituted movement to carry out this line of work. We secured from the university last year a small appropriation to carry on the work, and we hope each year to have it increased. We recognize that perhaps the chief obligation resting upon our teaching institutions is to provide for the needs of the man who is in the daily practice of medicine. After that we believe there is a second obligation to care for the young man particularly who wishes to take on extra qualifications, who cares to study for a period of three, five or more years, preparing perhaps for leadership. I do not believe that it is exactly the same all over the country as it is in the experience of Dr. Dannreuther in New York, that all of these men want to be teachers. Perhaps it is true that the majority do but there are still a goodly number who want to go out and practice and their ambition is to be leaders in their work. I think this is a most worthy ambition.

PROFESSOR R. W. JOHNSTON, EDINBURGH, SCOTLAND.—Dr. Davis has just referred to the obligation which the State has in regard to postgraduate teaching and in particular to the special courses which might be given to men in general

practice. It may interest you to know that in Britain the State has for some time past undertaken that duty in regard to practitioners working under the National Health Insurance Act, which covers practically all working people. In Scotland we have a large number of doctors in general practice situated in remote parts, whose incomes are necessarily very limited indeed, and a system has been devised to assist any of these men who may express a desire to undertake postgraduate study in any branch of medicine or surgery. The Department of Health arranges in the first place to provide him with a *locum tenens* to carry on his work during his absence, or at any rate with funds to cover the expense of a *locum tenens*; and gives him a certain sum of money adequate for his board and lodging during his period of study and to pay the small fees which are necessary. If a man who has been in practice for some years does not express any particular desire to undertake some form of "refresher" postgraduate course, the Department of Health does not hesitate to suggest to him the propriety of his doing so! In Edinburgh we have a flourishing postgraduate school during the summer vacation, and although our postgraduates come from all over the world, yet we always have a number of men who have come forward owing to this State-aided scheme. We have courses on general medicine and general surgery, and we have a joint course of obstetrics, gynecology, and diseases of children. This course occupies a month and we generally have from 18 to 20 postgraduates, including always a number of doctors from this country.

DR. DANNREUTHER (closing).—I believe that the discrepancy between Dr. Kostmayer's figures and my own may be due in part to the fact that he has experienced a great deal more difficulty in organizing the necessary staff of interested assistants who are willing to devote sufficient time to postgraduate teaching. The success of a teaching group, particularly in a postgraduate institution, depends largely upon establishing a personal contact with each matriculate. It is essential that the instructors, as well as the head of the department, manifest a sincere interest in what the student is trying to accomplish, guide his progress so that none of his time is wasted, and devote ample time to his instruction.

I do not see any difficulty in the organization of a combined Department of Obstetrics and Gynecology in any institution, as the director of the department need not necessarily be equally active in the two branches. He may direct and correlate all the activities, but have some one else carry equal responsibility for the work in the branch other than the one in which he himself is practicing.

Referring to the comment of Dr. Davis, so far as our department in the New York Postgraduate Medical School is concerned, we see comparatively few men with specialistic ambitions. The majority of those who take our courses have no desire to become absolute specialists in gynecology; most of them have been in general practice or have done general surgery over a period of years, and expect to continue the same type of work. On the other hand, it seems logical to infer from the demand for our courses that the general practitioner and general surgeon are both coming to a realization of the increasing importance of the nonoperative therapeutic methods.

DR. F. S. WETHERELL, Syracuse, N. Y., read a paper entitled **Pseudo-peritonitis Due to External Traumatism**. (Published elsewhere. Will also appear in the current volume of the Association's Transactions.)

Dr. L. A. CALKINS, University, Va., read a paper entitled Factors Affecting the Length of Labor. (For original article see page 294, February issue.)

DISCUSSION

DR. A. M. MENDENHALL, INDIANAPOLIS, IND.—Dr. Calkins' very brief paper represents a tremendous amount of work. I knew nothing about coefficient of correlation, but sought to enlighten myself about it. I at first approached the mathematicians but they did not give me very much help. I then studied it in connection with psychology, particularly in connection with the work of statisticians. Now it is rather difficult to harmonize their conclusions with our preconceived ideas. It is exceedingly difficult for me to believe those figures. I have no doubt whatever that they are correct, but whatever the method of approach in obtaining such facts as contained in Dr. Calkins' conclusions, I am led to think that there is something wrong. I have the impression that the elderly primiparas have longer labors than the younger primiparas. I cannot accept his statement regarding this until further investigation has been made. I cannot help but feel that the fat woman has a longer labor than the woman of ordinary build. We have perhaps drifted into the habit of expecting a fat woman to have longer labors although we know that there is an occasional woman who has an atypical pelvis, but the fat woman usually has a small outlet and there is consequently a longer labor.

Then, too, it is hard for me to change my preconceived ideas that a large baby does prolong labor. I also still believe that a small pelvis does very definitely prolong labor.

Dr. Calkins brought out the fact that in handling this coefficient, the element of probable error must not be greater than a third or fourth of the coefficient or its reliability is very much doubted. Furthermore, I found one authority, Rugg, who maintains that the coefficient grows in reliability in exact proportion to the number of patients studied, as Dr. Calkins admits. I hope that I may have cases that are easily available in my records in Indianapolis so that I may have them studied by Dr. Calkins' method because if they prove what he has apparently proved by his statistics, it will be a very marked revelation to me. This authority, and I am quoting entirely, having no knowledge myself, says that the coefficient must be 0.3 or 0.6 for reliability. This same authority says there are other authorities who maintain that the coefficient does not need to be greater than 0.2 in order to be reliable, and that there is a personal element of the investigator that must enter into all this because there are certain hypotheses which are assumed. DR. R. T. LA VAKE, MINNEAPOLIS, MINN.—I am so familiar with Dr. Calkins' mathematical accuracy that I feel confident if he says that stout women do not have longer labors because of their stoutness, nor elderly women because of their age, that, as far as it is possible to determine such facts from this series of 1200 cases, he is correct.

Any observations and figures intended to aid in prognosticating the probable length of a labor are of great value, both from the standpoint of the effective apportionment and conservation of our time and energy and from the standpoint of the formulation of tentative plans for the proper handling of each individual case. Under normal conditions in reference to the size, presentation and position of the passenger, we would likely agree that the first factor of importance in prognosticating the probable length of a first labor is the pelvis and its measurements. In this regard, after getting all the measurements and satisfying myself that delivery is possible from the measurements of the true pelvis, I check back over

the external oblique measurements and have found them to be the most suggestive in relation to the computation of the probable length of labor. The average is $22\frac{1}{2}$ cm., suggesting an average length of labor; 21 cm. and below a just minor pelvis suggesting a long labor; and 24 cm. and above a just major pelvis suggesting a very short labor.

Another and possibly the most important factor, although one seldom mentioned, is the hereditary stamina that often permits a little woman to dilate the birth canal and push a comparatively large baby through a relatively small pelvis in a short time, whereas the lack of this stamina may make it difficult for a large woman to dilate the birth canal and push a comparatively small baby through a relatively large pelvis. Nowhere in medicine will a family history give one more suggestive data. If a woman's mother delivered quickly and with ease, that woman, even with a comparatively small pelvis, is likely to deliver quickly and with ease. The correctness and importance of this observation I have seen proved many times where the hereditary element was the deciding factor in determining upon a test of labor in the face of strong opposition on the part of those advocating an elective cesarean.

A factor of great practical importance in the apparent length of labor is the amount of effacement of the cervical canal and dilatation of the external os that takes place before labor pains begin. Experimentally, daily rectal examinations in the last weeks of pregnancy will show one that many women come to their first pain in labor with the cervical canal nearly effaced, and a few with the external os nearly completely dilated. This effacement and dilatation may take many days for its accomplishment. Many very rapid labors are the results of this factor. The short duration of the pain element makes them seem short. These facts are very important because they point to the proper way of handling those less fortunate women who have distressing pain from the very beginning of effacement and dilatation, namely; making them as comfortable as possible with sedatives, etc., and giving them the same chance to dilate naturally, though it may take many days. Failure to wait for dilatation accounts, every day, for many tragedies due to meddling operative interference upon the sole indication of pain.

DR. IRVING W. POTTER, BUFFALO, N. Y.—I have very decided opinions about labor and its attending causes, based on considerable experience. I am not inclined to think that the woman who has had eight or ten children, has a longer stage of labor usually than the primipara. Another point that has not been mentioned and about which we hear very little, is the height of the symphysis. It has as much to do with the length of the labor as anything else.

DR. GRANDISON ROYSTON, ST. LOUIS, MO.—The point made by Dr. LaVake in regard to the dilatation of the cervix is very important. I believe Dr. Calkins eliminated cases of inertia. Uterine contractions of less than forty seconds duration accomplish but little. The force exerted by the uterine contractions, the resistance offered by the cervix, and the presentation of the fetus are all important factors in the duration of labor, although I believe that in the primiparous patient the resistance offered by the soft parts is the most important thing with normal presentation. I believe that occipitoposterior positions are more frequent than occipitoanterior positions. Most of our figures given in the textbooks are from examinations in the later stages of labor.

I have found that the short, fat woman usually has a longer labor, but certainly I feel that the condition of the cervix is the one most important single factor. When we hear of a woman being in labor for several days, she may have had contractions that length of time, but the changes that take place in the cervix as a result of these contractions constitute the only proof we have that she is actually in labor. The increased Braxton-Hicks sign should not be confused with true labor pains.

DR. GALKINS (closing).—This study was based on 1250 cases only. I am sorry that there were not more available. It is true that the accuracy of a study of this kind grows with the increasing number of cases and that it is highly desirable to have a minimum of 400 for an analysis such as this. With a larger series the probable errors are much smaller and the reliability of the coefficients is thereby increased. The size of the coefficient itself is not a factor as to its reliability. In fact, there are very few instances in biologic variables where one will get a coefficient as high as 0.3 to 0.6. The real test of a coefficient is its relation to its probable error. If the coefficient is four times its probable error there is not more than one chance in a thousand of its being incorrect.

Dr. LaVake spoke of determining the probable duration of labor beforehand. That was my sole idea in introducing this study and I am convinced, as a result of this work, that one cannot estimate accurately the length of labor from the relation of the size of the baby to the size of the pelvis, from the age or stature of the mother, or from the stage of pregnancy. The only information of value in estimating the length of labor, is the length, thickness, and the consistency of the cervix. Of course, we know little about what the labor pains will be like, except as Dr. LaVake has pointed out, that heredity may give us some idea. With a multipara, of course, the character of pains in previous labors is of great value. Dr. Potter spoke of the long labors in the seventh and eighth pregnancies. Frequent childbearing does tend to produce weak and ineffective labor pains in this group of patients. The general average is not different, however, from the second, third, or fourth labors.

Dr. Royston referred to the prolonged labor with occipitoposterior position. I purposely avoided the question of presentation because the study was already too long, without adding this additional variable.

Dr. I. W. POTTER, Buffalo, N. Y., read a paper entitled **Rupture of the Uterus, with a Report of Seventeen Cases.** (For original article see page 289, February issue.)

DISCUSSION

DR. J. P. GREENHILL, Chicago, Ill.—Naturally, rupture of the uterus having occurred 17 times in the experience of one individual is very unusual. At the Chicago Lying-in Hospital and its Dispensaries, in an experience of over 50,000 labors, we had only six cases of rupture of the uterus from all causes. Strange to say not one of the ruptures followed a cesarean section. Sixteen of the seventeen ruptures which Dr. Potter saw, followed abdominal delivery and I assume that all of these were cesarean sections of the classic type. As you all know, the incidence of rupture of the uterus after the classic operation is far greater than it is after the cervical one. Holland reported an incidence of 16 per cent in a small series and in a series of over 1,100 cases collected in the British Isles, he found the incidence of rupture in a subsequent pregnancy or labor to be 4 per cent. Rupture of the uterus following the low, cervical cesarean section is very unusual. Altogether in the entire world literature there have been reported only 22 ruptures after the cervical operation and it is safe to say that at least 50,000 of these operations have been performed. Hence the frequency of rupture after these operations is very small. Furthermore, all but three of these accidents occurred during active labor when the patients were under observation. On the other hand, a large proportion of the ruptures which occurred after the classic operation took place during pregnancy under unfavorable circumstances. For example, Holland makes the statement that among 84 ruptures, 48 of these catastrophes occurred during labor, while 36 or almost 43 per cent took place during pregnancy. Dr. Potter's mortality

was very low as compared with the usual mortality for ruptured uteri and he is to be congratulated.

DR. PAUL TITUS, PITTSBURGH, PA.—Because Dr. Potter is at his best when some one seems to disagree with him, I venture to take issue with one of his statements. This is that pituitary extract should never be used for induction of labor, the intimation being that this may cause rupture of the uterus. On the basis of a fairly large series in which it was used with castor oil and quinine for the therapeutic induction of labor according to the teaching of Watson and also Williams, I am thoroughly convinced that its judicious use is accompanied by no such risk. By this I mean its administration before labor has begun solely to aid in the induction of labor, emphasizing that it is instantly to be discontinued if labor pains begin.

Thus there is a distinction between giving minute doses by hypodermic injection or by Hofbauer's nasal application as a part of a course of treatment to bring on labor, and its use during labor to increase the force of the uterine contractions. I subscribe completely to a dictum against its use at any time during actual labor but do not believe it is harmful if given as outlined before labor has begun.

I believe that an analysis of this work which Dr. Potter has presented brings out two facts; first, that he should not condemn and advise the discarding of a practice that has proved valuable in the hands of many competent men solely because a misunderstanding of its proper application may occasionally have resulted in its injudicious use; second, that frequent occurrence of ruptured uterus following cesarean section in one's practice suggests that the technic of the section is open to question. I, for one, have long been convinced that the lower uterine segment cesarean section has many advantages over the older classical section and that rupture is much less likely to occur in subsequent pregnancies if the scar is in the lower, noncontractile portion of the uterus than if it is in the fundus.

DR. H. W. SCHOENECK, SYRACUSE, N. Y.—I want to discuss the separation of the scar in the so-called classical section. The literature has shown that this occurs much more frequently than we were wont to expect.

In our cases of section which come for subsequent delivery, we make it a point to go over the line of uterine incision by abdominal palpation. This procedure is followed out in hope that we may detect these incomplete ruptures before the onset of labor. Having done this over a period of years, and having found no break in our incisions, we came to the conclusion that there must be something in our method of closing the wound which avoided separation. An incomplete rupture in a woman pregnant eight months came to our notice a short time ago. This woman had a section in 1926. During an examination in one of our prenatal clinics, the rupture of the wound was discovered by one of the instructors. It was easily detected by the students who were present. This patient was sent to the hospital and a section done immediately.

In respect to the use of pituitrin, this is limited in our practice to the placental stage. I do not object to its use during labor, if done judiciously, by a man who knows with reasonable certainty that no insuperable obstacle to delivery through the natural passageway exists. My reason for not advising it is that the drug in the hands of the average practitioner is productive of great harm. We teach this to the students and I feel that we should set an example in keeping with that teaching.

DR. DAVID HADDEN, OAKLAND, CALIFORNIA.—This spring I had a case which illustrates very nicely the difficulty of making a diagnosis in ruptured uterus. A young woman of about twenty-three years of age, with her first baby, came to me early in the spring giving a history of several subacute and one rather acute attacks of appendicitis. She had considerable tenderness over the right side and some

digestive disturbance. I watched her for a few weeks and considered it necessary to take out the appendix. We found a subacute appendicitis and her convalescence was absolutely normal. What we could see of the uterus through the incision appeared perfectly normal. She went on for the next three months, with no digestive disturbance whatsoever, picked up in weight and was in every way in excellent condition. I was called at midnight later on and found her suffering with vomiting, diarrhea, a certain amount of shock, and very definite pain in the upper abdomen. This had followed a very injudicious meal that evening. There was no distention of the abdomen and no tenderness anywhere. At the end of another twenty-four hours she went into labor and delivered herself normally. For the following four or five days convalescence was perfectly normal. The bowel movements were not quite as free as they had been and she began to complain of a little digestive disturbance. There was no elevation of temperature. Food was withheld for about two days suspecting we might have a pseudoleiomyoma, although her general appearance was good. When she began to take food again there were symptoms of intestinal obstruction. After a few days the abdomen was opened and found full of a foul smelling blood and she died of embolus about two days later.

DR. E. M. LAZARD, Los Angeles, California.—At the General Hospital in Los Angeles we have had our share of ruptured uteri brought in and an occasional case brought in with an obstruction, a neglected case which ruptured during the patient's later labor in the hospital. I well remember one case a number of years ago that was brought in at midnight. That woman had had two normal deliveries. Her third baby had been delivered by cesarean section, because of too large a baby; she had had two prolonged labors following the cesarean section and was brought in at the eighth month of her third pregnancy following cesarean section, having ruptured the uterus twenty-four hours before being brought in. She gave a history of having gotten out of bed to go to the lavatory and of having fallen back on the bed in a faint from severe pain. She was sent into the hospital twenty-four hours later in extreme shock with all the evidences of ruptured uterus. We operated as soon as we could get consent but before the patient had been fully anesthetized she died. A postmortem examination was done. The fetus, placenta, and membranes were free in the abdominal cavity; there was a rupture through the scar of the cesarean section that had been done a number of years before; although the uterus had gone through two pregnancies and difficult labors and withstood them without any trouble; this time rupture had occurred before she went into labor at all.

DR. A. M. MENDENHALL, INDIANAPOLIS, IND.—I would like to supplement Dr. Potter's remarks by saying that within the last year I have made considerable study of the cases of ruptured uteri due to pituitary extract, 90 of which I was able to obtain. The fact I want to bring out is that in a great many instances, and not following cesarean section, we found that there were pathologic lesions in the uterine wall that had not been suspected. In other words, we must look for diseased uterine walls in case of ruptured uteri.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—I have in my collection ten ruptured uteri. One of these is rather an unique case, different from any Dr. Potter has reported. This uterus had ruptured between the fourth and fifth months of pregnancy through the midpoint at the fundus. It was the placental type, as Dr. Potter has classified these different ruptures. The placenta was slightly protruding through the thinned-out wall and within the abdominal cavity there was a large adherent clot. There was evidence of a large peritoneal hemorrhage. The patient died. Microscopic examination of the uterus showed just what Dr. Mendenhall has been speaking of. There was a marked hyaline degeneration at this part of the uterus. This patient was suspected of having an induced labor by criminal intent

but the cervix was intact, the membranes were intact, and there was no evidence of abortion having been attempted.

DR. POTTER (closing).—Fifteen of these cases I operated upon. One case was never operated upon; she was attended by a midwife. One case was operated upon by another doctor seven or eight years ago. That makes the number of ruptures fifteen in over 1700 cases.

Now rupture does occur from pituitrin and I still maintain that pituitrin should not be used. Dr. Titus can use it successfully because he understands its use. The trouble is that the men I see using it do not follow out instructions but administer 2 or 3 c.c. at once.

Regarding the type of section in these cases, the technic was the same in each case. Each uterus was packed with gauze, the wound closed with three layers of catgut, and pituitrin was put into the uterine muscle after the uterus was emptied, and sutured. In spite of this we had these ruptures. I wanted to report these cases because I know they occur and that other men also have them. I did not do the low operation because I do not like it.

DR. MIKLOS TEMESVARY, Budapest, Hungary (Guest), read a paper entitled **A Rapid Nonsurgical Means for Aiding Childbirth**. (For original article see page 267, February issue.)

DR. TEMESVARY.—That is not a contraindication so far as the size of the fetus is concerned. If the heart pathology is not very marked forceps can be used if necessary.

DR. ANDRE CROTTI, Columbus, Ohio, read a paper entitled **Cecum Mobile**. (For original article see page 356, March issue.)

DR. JAMES W. KENNEDY, PHILADELPHIA, PA.—When we have a better understanding of the function and reactions of the peritoneum we will have better knowledge of many of the abnormalities of structure, location, form, and organic relations of intraabdominal organs.

In our enthusiasm over physicochemical methods of study, we should not forget the importance of structural development. I find authors in discussing the mobile cecum very often make the statement that the mesentery of the cecum fails to become fixed or fused with the posterior abdominal wall. It is my understanding that the cecum has no mesentery, so in discussing this subject of mobile cecum we must more accurately consider the mesentery of the ascending colon.

When an organ has once formed a mesentery and later becomes a retroperitoneal or partially retroperitoneal organ, it probably loses its mesentery in one of two ways. Either the peritoneal planes which cover the mesentery and also help constitute it, spread apart and thus permit the ascending colon to be mushroomed, so to speak, against the posterior abdominal wall and thus become a partially retroperitoneal or fixed organ, or, one peritoneal side of the mesentery becomes fused with the parietal peritoneum and thus fixes the organ. This later solution of fixation of the colon, I believe, is the popular view.

* * * *

That mobile cecum has become a well-recognized entity, Dr. Crotti's discussion has well brought out, and further, he has pointed out the great frequency with which the appendix has been removed, whereas, the floating cecum has been at fault.

I feel in a large percentage of cases the floating cecum can be diagnosed by clinical history and physical signs.

One need not worry about the appendix as that can be taken care of at the same

time that the mobile cecum is being fixed. One may confuse the condition with the floating kidney and I have twice confused cystic tumor of the ovary with the wandering cecum. I have not found the x-ray infallible as a diagnostic means. I am not able to give a normal location of the cecum as it is one of the true nomads of the abdominal cavity, it has no normal location.

The three great wanderers of the abdominal cavity, are first, the omentum; second, the sigmoid; third, the cecum. I have twice opened the abdomen for a complete bowel obstruction caused by mobile cecum from flexion upward of the organ.

I have seen a partial volvulus in the mobile cecum. There is no question in my mind but that the mobile cecum predisposes to intussusception just as does an elongated mesentery of the small bowel. I suppose it could be truthfully said that mobile cecum is a misnomer; it is the colon which is abnormal in its mobility. Volvulus cecum is not a bad term. From a diagnostic standpoint we have as a rule slight tenderness, little if any rigidity, and Dr. Morris' *cider barrel* in the *spring* symptom is often present, the cecum being distended with gas.

Anatomical cecopool is a term which has been applied to mobile cecum. I would qualify this, for we could have retained fecal matter in the cecum without symptoms, as there is more or less stasis of fecal movement in this organ. The mobile cecum is another example of the statement that it is indeed an ill wind that blows no one good. I have on several occasions operated for a gangrenous appendix where the mobile cecum was held in peritoneal embrace by the sigmoid and thus prevented a diffuse, septic condition, and I have further seen a good number of cases when operating for pelvic suppurative conditions, the mobile cecum and sigmoid bound together by peritoneal attachment and thus forming a terraced layer over the pelvic condition and limiting the peritonitis to the pelvis.

DR. GEORGE P. CHANDLER, KINGSTON, N. Y.—I agree with everything that Dr. Crotti has said. I have been doing the operation in the same way that he has described but I think something else should be done to make it complete. The cecum should be fixed but there is an ileocecal fold which has a great deal to do with the production of symptoms in chronic appendicitis. After doing what the Doctor advises, as a routine I always cut the ileocecal fold for the following reason. There are two folds on the inside of the cecum which are fixed in the ileocecal valve and the closure of this valve comes about by the fact that there is a slight intussusception of the ileum into the cecum. If there is anything that obstructs this intussusception there is a leakage and consequent return flow of gas into the ileum causing reverse peristalsis and a lot of gastric symptoms. So as a routine I always cut this fold after taking out the appendix. These cases get well and I think that it is often one of the causes of failure in the operation for so-called chronic appendicitis where the appendix only has been removed but the symptoms remain the same. If this cutting of the ileocecal fold is done the symptoms complained of will eventually clear up. If you bury the appendix you will interfere with the intussusception of the ileum against the ileocecal folds. The appendix should be ligated and cut off with cautery or scissors dipped in pure carbolic acid.

DR. W. S. BAINBRIDGE, NEW YORK CITY.—In a time not so remote, the term, "stasis," as applied to any portion of the bowel below the papilla of Vater, was considered unthinkable by the vast majority. I am glad to have the doctor emphasize the question of stasis in this part of the lower canal. Most of us have seen cases of so-called chronic appendicitis where the symptoms recur after the removal of the appendix. In many appendicitis, the longitudinal bands are detached from the meso-appendix and are not secured again in any substantial way. Thereafter the mechanical relations of this part of the bowel are impaired. When the patient assumes an upright posture, and there are no

adequate attachments for the longitudinal bands from the ileocecal orifice to the lower portion of the caput coli the fecal matter is retained in the cecum. Therefore, in removing the appendix, I am particular about anchoring the longitudinal bands to the mesoappendix, or the posterolateral fold at the brim of the pelvis.

There can be no question but that a dilated or mobile cecum may be a competent producing cause in many toxic conditions of obscure origin.

DR. WALTER T. DANNREUTHER, NEW YORK CITY.—It has always been my impression that infection of the retrocecal tissue is one of the most dangerous post-operative complications that we have to handle, and it seemed to me that the illustrations of Dr. Crotti's technic showed an unwise invasion and exposure of that area. I would like to ask two questions: Have any of these patients developed a retroperitoneal abscess? Second, why are the sutures placed in the convolutions of the colon rather than in the longitudinal bands?

DR. CROTTI (closing).—I have not seen an abscess so far, although if you go through the literature you will find some men have reported abscesses in that region and some will go as far as putting a drain into the parietal region. I believe that possibly it might be a good plan in the future to put some mercurochrome on the posterior surface of a colon which may be producing a plastic peritonitis and thus avoid a possible injury to the colon.

I feel that the cecum should be always investigated whenever the abdomen is opened and as you perform an appendectomy the opportunity to fix up that anatomical condition ought to be taken advantage of. I think the benefit to the patient is going to be a great one. The results are very satisfactory. The patient who feels in the iliac fossa a colon or a cecum that was not there before will complain of a peculiar sensation because the cecum or colon distends and produces some weight. That soon subsides; the symptoms last only a few weeks. The constipation usually subsides altogether, the pain subsides and the systemic symptoms are greatly relieved. I feel that the operation does not do much damage to the patient, is not dangerous, and should be done routinely.

DR. J. E. KING, Buffalo, N. Y., read a paper entitled **Postoperative Abdominal Auscultation**. (For original article see page 273, February issue.)

DISCUSSION

DR. E. J. ILL, NEWARK, N. J.—It is apparent that Dr. King does not make auscultation per se the beginning and end of his knowledge of bowel contractions. His very careful study can be taken with considerable seriousness and shows much careful observation. Those of us who have for a long time used the stethoscope for auscultatory symptoms of the bowel will surely have derived a lot of personal comfort when after eighteen to twenty-four hours one begins to hear moderate rhythmical signs in the abdomen. It is safe to say that in another twelve or eighteen hours the patient will have passed gas to everybody's satisfaction and comfort. However, when these gurgles immediately start with loud and irregular noises, our anxiety of what may happen will oblige us to watch the patient with anxiety. It has been my experience with the cases of kinked bowels, which, however, I rarely see, or with nonoperative obstruction, there is a sudden loud roaring noise, which immediately dies down to recur at shorter or longer intervals. If we carefully go over the ground we may often enough find just where such obstructive symptoms are loudest, much to our relief when operative interference becomes indicated.

DR. F. S. WETHERELL, SYRACUSE, N. Y.—Dr. King has brought out that we are still physicians even though we are surgeons, that we may carry a stethoscope.

If a surgeon is seen in our city with a stethoscope in his hand, he is looked at with suspicion that he may be going back into general practice. Even the obstetrician has to wear his stethoscope on his forehead.

I consider this an opportunity for clinical research. A busy man can always do clinical research and check on his findings. The one important thing, brought out to me at least, was the colon sound. It, by examining many cases, we can accustomed our ears to know that we are hearing a colon gurgle, it means that we will have added a good deal to our postoperative treatment by knowing whether we are going to get good results from an enema. We know that often an enema is given without results. Of course, distention is often above the umbilicus, where a stomach tube rather than an enema tube should be used; but if we can find out when the time is ripe for an enema, we will have accomplished a good deal.

DR. GORDON K. DICKINSON, JERSEY CITY, N. J.—I have for a number of years been teaching internes in the hospitals that it is very, very important that they should auscultate every abdomen until they get sufficiently well acquainted with the sounds which exist and conditions which produce those sounds. I much prefer that they should first use their ears, then if necessary after that make use of the stethoscope.

For twenty years I have had experience with tuberculosis, being Director of a very large hospital and clinic. It is demanded there in making the examination and tuberculosis that after everything possible has been learned from percussion and clinical history that the examiner must listen first with his ear and then with his stethoscope and I think every young man should be taught to listen to the sounds in the abdomen with his ear and then with his stethoscope, so that later in life he will recognize the regular and irregular sounds, and have a proper sensory touch.

Another point: I do not like enemas, for I think they only touch the surface. Dr. Keup, a gastroenterologist, some years ago introduced what he called the double current rectal irrigation. I do not hear it talked about and do not find many men who know anything about it but if you give a double current rectal irrigation with water of a temperature of 120° F. for twenty minutes you will find it will do more good than an enema. It will stimulate the sympathetics. One of the great dangers is progressive tympany. By stimulating the sympathetics one will bring about a peristaltic wave which will bring down gas from higher up than any enema could reach. You will stimulate the small intestine and the solar plexus and the kidneys within twenty minutes. At the end of twenty minutes at least you will have a stimulation of heart action, a breaking out in perspiration, all of which is followed by improvement in general condition. You cannot acquire all of that through an enema.

This paper was also discussed by Drs. Hadden and Babcock.

DR. KING (closing).—I am thoroughly convinced that abdominal auscultation is a distinct aid where there is definite evidence of postoperative intestinal disturbance. The ordinary house surgeon is a rather practical individual. It is surprising how these young men, after having interest aroused in this subject, will pursue it without any further suggestion and will take it to the other services.

Unfortunately one cannot make positive or satisfactory classification of intestinal sounds as they vary so under varying conditions, but if one will make a systematic study of the postoperative abdomen by auscultation critically, carefully, and understandingly, it will prove to be of much help.

I have never seen a case of postoperative ileus. I have had every mistake that could befall a surgeon and yet I have never seen a case that I thought might properly be regarded as a paralytic postoperative ileus. It is a term that has been handed down to us just as we have many other terms in medicine, and we continue to use it because we do not know how to get rid of it.

THE NEW YORK OBSTETRICAL SOCIETY

MEETING OF OCTOBER 8, 1929

DR. CARL HARTMAN read a paper (by invitation) entitled *The Corpus Luteum and the Menstrual Cycle Together With the Correlation Between Menstruation and Implantation*. (For original article see page 511.)

DISCUSSION

DR. R. T. FRANK.—You have had the privilege of listening to an exposition of some fundamental facts in sex physiology. Dr. Hartman has been personally very active in laying some of these foundation stones.

In the first place, I am going to take Dr. Hartman at his word and remove the ovary to see what happens.

In the second place, he said that perhaps we will find the cause of the menstrual cycle in other glands of internal secretion. This possibility struck me many years ago, and in 1917 I had already, in castrated animals, removed the thyroid, the adrenals, the pancreas, and the thymus. I had not succeeded, because of my lack of technical skill, in removing the anterior pituitary, but recently, Dr. Phillip Smith has succeeded in doing so. In some of these castrates in which, for example, the adrenal and the thyroid had been removed, the sex cycle could be artificially produced by injecting female sex hormone. That, of course, is not a complete and final proof that only the female sex hormone is necessary for the cycle. In fact, we know today, from the work of Phillip Smith, and Zondeck and Aschheim that the sex cycle is initiated by means of the anterior pituitary; that is, puberty is produced through that gland, but that merely is putting the crucial point further off. Why does the anterior pituitary gland function, or begin to function in such a fashion that it stimulates the ovaries at this given time? Why does puberty begin? We have not gotten to the fundamentals of finding the stimulator of this secondary activator of the gonads. You can reproduce the sex cycle in a castrate typical of its particular species, whether it be the mouse, the rat, the guinea pig, the monkey, or the human being, by injections of the active female sex hormone in extract form. In the monkey, for example, Allen and Pratt, gave a certain quantity of female sex hormone injected over a period of days, stopped the injection, and menstruation resulted. In a human female castrate Aschheim and Zondeck gave large quantities of female sex hormone, and although they do not claim to have produced a typical menstruation, because they are critical in their work, and therefore did not call the short bleeding menstruation, they examined the mucosa of this castrated woman and found that it had all the hallmarks of the premenstrual changes.

Dr. Hartman referred to the corpus luteum. This being the largest objective finding in the ovary, particularly in human beings during operation, naturally attracted attention at the early stages of these physiologic investigations. Today I believe we all agree that we can leave the morphologic factors out of the foreground, if we conceive that any tissue which can produce female sex hormone can produce the changes in the sex organs, and in menstruating species menstruation. It would mean if a human being were x-rayed to such an extent that all the follicular apparatus is destroyed, but not to such a degree as to have entirely demolished the germinal epithelium, that a period in this regenerative process could occur during

which nothing would be found in that ovary except down-growing germinal epithelium and that during this stage menstruation might occur. That is transferring Parkers' experiments in the mouse to the human being. In the mouse at that stage the previously x-rayed female who is undergoing regenerative changes begins to have a sex cycle. Although I have not the actual proof, not having removed an ovary at such time in the human, it is quite conceivable that the same applies and menstruation may occur before any regeneration of follicles takes place. If any female sex hormone is circulating in the blood, a woman is going to have the premenstrual change, although she has no follicle or corpus luteum.

I will grant Dr. Hartman's statement that we know nothing of the real mechanism of menstruation, why in some animals, like the monkey, for example, or why in some human beings menstruation should occur, although the mucous membrane is in a resting stage. In others menstruation occurs when the mucous membrane shows the tremendous premenstrual change occurring there, the bleeding taking place though the almost intact epithelial covering by diapedesis, and why finally the most characteristic menstrual change, in which the exfoliation of the mucous membrane occurs, is not a regular and exclusively present condition.

To my mind, one of the greatest advances in primate physiology was when Corner first found a well-preserved ovum in the fallopian tubes of the monkey, and shortly afterward Allen and Pratt found well-preserved ova in the oviducts of the human female. That placed the time of ovulation within very definite limits.

I believe that in the human being we will have to be extremely cautious in trying to find small traces of blood in the vagina at the time of ovulation. Pathologic conditions in the human being are so frequent I would consider such a criterion misleading. On the other hand, I must take issue with Dr. Hartman in this: we have no proof that menstruation *frequently* takes place without ovulation in human beings. In the average fertile female there is no safe period. There are women who at any period of the menstrual cycle or of the year, if exposed to impregnation, will conceive promptly and without fail. Of course, we have the sterile class who are pathologic and not to be mentioned in this discussion. The monkey has sex seasons, I will concede. The final link still missing in our physiologic investigation is a monkey that shows menstruation, but in which copulation only takes place at estrus as in the lower forms. Perhaps if the South American monkeys are investigated, such an important species and link will be found.

I will conclude by saying that any tissue which produces female sex hormone can likewise produce the estrous cycle in any species. So far we know that the tissues which produce this necessary hormone are the germinal epithelium, the follicle, and the corpus luteum. The corpus luteum gives up this female sex hormone to hypoid solutions; it gives up another hormone to aqueous extractions. That is the one which the speaker referred to as being used by Corner. In addition to that, female sex hormone is found in huge quantities and probably produced by the placenta.

I do not think it is worth while to place too much importance on bleeding, whether menstrual or estrous or preestrous, as in the cow and in the other animals which bleed at that time, because, after all, the whole purpose of the sex cycle is not abortion. The abortive cycle is accompanied by bleeding, but in the fertile cycle bleeding plays no rôle.

DR. ALFRED PLAUT.—Dr. Hartman has approached this subject from the zoologist's point of view, and I would like to make an additional observation from the realm of comparative anatomy.

It has been said that organs other than the ovary must be looked for in order

to explain the sexual cycle and related phenomena. A keynote in Dr. Hartman's paper was the difference between the mostly seasonal distribution of sex activity in the lower animals, including the monkey, and the all-year-round sexual life of the human being. Now, the organ which, aside from the ovary, seems most important for sexual life is the hypophysis. It seems of importance that in the structure of this organ we have all lower animals, including the monkey, in one group, and man, the orangutang, and the chimpanzee in the other group. The hypophysis consists of three lobes—the anterior lobe, the intermediate lobe, and the nervous posterior lobe. We are not interested here in the nervous posterior lobe. In the fish the intermediate lobe is very large, sometimes larger than the anterior lobe. In reptiles and birds it is considerably smaller, and still smaller in mammals like the cat and the camel. But in all these animals the intermediate lobe is a well-defined, fully developed organ. It is essentially the same in the monkey. But in the adult human being this intermediate lobe is entirely rudimentary; there are some cysts and small glandular structures, but no well-defined organ. And (this is most important) in a female adult chimpanzee and a male adult orangutang I have found exactly the same hypophyseal arrangement as in man, namely, a rudimentary intermediate lobe.

Future investigations will show how far there is a parallel between this phylogenetic change of hypophysis and the gradual change from seasonal to permanent sex activity. Other anthropoid apes (hylobates and gorilla) must be examined and perhaps the lemurs, too, which seem to be somewhat nearer to our hypothetical ancestors than the macaques and similar monkeys.

DR. HARTMAN (closing).—Certainly there may be an ovulatory season and a nonovulatory season in the monkey, but there is no closed season to copulation. While the male in summer takes less interest in the female, there are multiple sperms in the summer, and whether the animal menstruates or not any time of the cycle, copulation takes place.

DR. JAMES HEYMAN (by invitation) addressed the Society on his **Experiences with Radiologic Treatment in Gynecology, with Special Reference to Carcinoma of the Cervix**. An abstract of this paper follows:

In guiding the development of the radiotherapy at the Radium-Hemmet (Radium-Home) in Stockholm, Forssell has been governed by the principle of treating, at first, only inoperable cases of malignant tumors. When undoubted results had been gained in these cases and the technique had become more firmly established, he then took on the treatment of borderline cases. Operable cases were not treated at Radium-Hemmet until definite results had been obtained in inoperable and borderline cases.

According to this principle practically only inoperable cases of carcinoma of the cervix were referred to Radium-Hemmet during the earlier years. At the same time as our first five-year results, in cases treated by a uniform technique, were published in 1919-1920, we expressed the view that attempts to treat radiologically also operable cases of cancer of the cervix were justified and desirable. Since 1920 the leading gynecologists in Sweden (Forssner, Essen-Moeller, Ahlström) have given up operating upon cancer of the cervix.

The distribution of operable and inoperable cases in our series before and after 1919-1920 is shown in Table I.

TABLE I. SURVEY OF ALL CASES OF CANCER OF THE CERVIX UTERI TREATED AT RADIUM-HENRIET, 1914-1923

YEAR	NUMBER OF CASES TREATED	OPERABLE	PER CENT	AND BORDERLINE CASES	PER CENT
1914	26	3	11.5	23	88.5
1915	40	1	2.5	39	97.5
1916	47	3	6.4	44	93.6
1917	63	7	11.1	56	88.9
1918	41	5	12.2	36	87.8
1919	76	18	23.7	58	76.3
1920	96	30	31.3	66	68.7
1921	113	41	36.3	72	63.7
1922	131	41	31.3	90	68.7
1923	104	39	37.5	65	62.5
	737	188	25.5	549	74.5

During the period 1914 to 1923, inclusive 790 cases of carcinoma of the cervix were referred to our gynecologic department. Of these 737 were admitted for treatment.

TABLE II. FIVE-YEAR RESULTS IN RADIOLOGICAL TREATMENT OF CARCINOMA OF THE CERVIX UTERI AT RADIUM-HENRIET, 1914 TO 1923

NUMBER OF CASES	FREE FROM RECURRENCES AFTER FIVE YEARS	PER CENT
737	170	23.1
737 (including 53 patients not admitted for treatment)	163 (excluding 7 patients operated upon)	22.1
790	163	20.6

The table shows that out of 737 cases primarily radiologically treated, 170 patients were alive and free from recurrences five years after the treatment, i.e., 23.1 per cent five-year cures.

This series includes 34 patients who have undergone surgical operation after failure of radiologic treatment. Of these, seven patients were alive at the end of the five-year period. If these seven patients are deducted, the five-year result amounts to 22.1 per cent.

If, finally, in estimating the result, I include 53 patients who, on account of lack of accommodation, have not been admitted, or who have been in a too hopeless condition for treatment, the five-year result amounts to 20.6 per cent.

Out of 737 patients sixteen have died in connection with the treatment, i.e., a primary mortality of 2.1 per cent. The above figures are concerned with the total number of cases, and thus give the absolute results. If we now consider the results obtained in the treatment of the operable cases we find the following:

TABLE III. FIVE-YEAR RESULTS IN RADIOLOGICAL TREATMENT OF OPERABLE CASES AT RADIUM-HENRIET, 1914-1923

NUMBER OF CASES TREATED	FREE FROM RECURRENCES AFTER FIVE YEARS	PER CENT
188	82	43.6
188 (including 6 patients operated upon and alive)	76 (excluding 6 patients operated upon and alive)	40.4

From 1914 to 1923, 188 operable cases were treated. Of these 82 patients were alive, free from recurrences after five years, i.e., there were 43.7 per cent cures among operable cases. If also here we deduct those cases which, after unsuccessful radiologic treatment, were successfully operated upon, we get out of 188 cases 76 cured for five years, i.e., 40.4 per cent cures.

Inoperable and borderline cases during the same period numbered 549. Of these 88 were cured and alive, free from recurrences after five years. The percentage of cures among these cases thus amounts to 16 per cent. In inoperable cases only, 492 in number, the five-year result was 13 per cent.

The demonstration of the results was followed by a brief report of the therapeutic technic employed at Radium-Hemmet. Those interested are referred to the detailed account given in *Acta Radiologica*, 10: Part 1. In addition the organization of the radiologic work at Radium-Hemmet was reported as described in the *Proceedings of the Royal Society of Medicine*, 22: April, 1929.

DISCUSSION

DR. GEORGE G. WARD.—It was my privilege with certain colleagues to visit this clinic three years ago. Of course, we could not help but be struck with the wonderful organization, the thoroughness with which the cases were studied, and the great care which was expended in following out the technic and particularly in the follow-up. We have no such follow-up in this country as they have in Sweden, where they have 100 per cent of patients kept under observation. If we get 85 per cent, we think we are doing wonderfully well, but there they miss no case.

We received a particular inspiration from our visit to Stockholm because we saw the results that were obtained by the use of radium as a salt and not necessarily by emanation, which requires such large quantities in order to obtain the emanation, and those of us who have smaller clinics and who have smaller amounts of radium at our disposal were naturally stimulated to keep up our efforts by the teachings of Prof. Forsell and Dr. Heyman.

One of the points Dr. Heyman brought out which is most important is that, while it seems quite simple to make a radium application in cancer of the cervix, it is by no means so simple as it seems. Very great damage may be done and long experience is necessary to properly apply the remedy in order that we may get the best results. Therefore, when we receive advertisements stating that if any doctor will send a description of the case that he has under observation the necessary radium and dosage will be sent to him, you will realize what damage can be done. We have had several instances that have come under our observation of that very great danger.

DR. WILLIAM P. HEALY.—Dr. Heyman emphasized a most important point, namely, if one is going to attempt to treat malignant disease properly as it is regarded in institutions devoted to the treatment of that disease, you must be really cancer-minded; you must be in the atmosphere which deals with the disease. It is quite out of the question to treat cancer of the gastrointestinal tract in any institution which is a surgically-trained institution and in which the surgeon sees only an occasional case. He is a pessimist from the start and is only going to attempt a certain amount of surgical gymnastics with the patient, and he cannot actually be expected to treat cancer. The greater part of his interest is in other surgical conditions. The same thing holds true of cancer in any other part of the body. We are quite convinced that the problem of cancer will only be advanced properly by the maintenance of institutions such as the Radium Hemmet in Stockholm, or the Curie Institute in Paris, or some of the institutions in this country,

institutions in which we have a rounded force, working upon the side of research, physics, and biology, as well as the clinical viewpoint.

The important results that have been obtained in cancer of the cervix are due to the fact that we are dealing with a type of epidermoid cancer which is peculiarly radiosensitive, quite different in its reaction to radiation therapy, from cancer of the breast, for instance. As a matter of fact, we know from the work done at the Memorial Hospital in a series of over 200 cases that at least 60 to 80 per cent of the patients with carcinoma of the cervix come into the radiosensitive group and only about 20 per cent of the patients are actually radioresistant, but even those patients can be well taken care of by radiation therapy, because we are dealing with a lesion which is accessible: it is in the cervix.

With respect to the methods of treatment, it does not seem to matter very much. When you compare the results in the large institutions in Stockholm, in Berlin, in Paris, in New York, in Chicago, the end-results obtained all run very much alike. We have 25 per cent of salvage in all our cases, just the same as Dr. Heyman has in his, but the most important thing of all is the need for early recognition of the disease, and we believe upon that point depends entirely the success of one's treatment. Sixty-six per cent of the favorable cases live for five years regardless of cell type. That is against about 18 to 20 per cent of the advanced cases. There is a distinct difference in the final result, depending upon the cell type. The very malignant cell type gives us the very best end-results because it is particularly radiosensitive.

We believe, as Dr. Heyman has briefly stated, that it is very important to combine with the local application of radium, the use of radiation applied externally about the pelvis, either by means of the high voltage x-ray machine or the large radium element pack. It is very much more economical to apply it by means of the high voltage x-ray machine. We have a four gram element radium pack at the Memorial Hospital in use twenty-four hours in the day. We have three technicians there on eight-hour duty, and patients are being treated constantly. To give a proper dose of radium therapy to the pelvis by the radium pack it takes one hundred and twenty hours at least, or one hundred and twenty thousand milligram hours. You can only give four doses in one hour. It takes thirty hours to treat a patient and that costs about \$300 to \$500. You cannot treat ward patients that way, but you can give four high voltage x-ray treatments to a ward patient at very little cost to the hospital or to the patient, and that builds up tremendously the amount of radiation effect which you are able to get by the use of radium in the cervix and in the vagina.

DR. OSKAR FRANKL of Vienna.—I would ask Dr. Heyman to describe his personal experiences with radiosensitivity. Personally, I take a stand which is different from that of most of the others in this respect. When in 1912, in Germany, the radium treatment of uterine cancer was discussed at the German Gynecological Association, we started work with radium as soon as possible in our clinic.

The doctor then stated that great differences exist between various types of malignant disease. For example, a man may have a cancer of the cheek and go without treatment for as long as ten years with no indication of metastasis, whereas another man with a cancer of the lip or of the tongue will have a general metastasis in a few months' time. Consequently, it was observed soon after the beginning of the treatment of cancer with radium that differences existed between the treatment of cancer with radium and with x-ray, and the doctor stated that "soon after work with radium was started one took a stand in this question."

From cellular experiments it had been found that the more immature or more embryonic the cells the more radiosensitive they are, in certain classes of tumors.

DR. ALFRED PLAUT.—I merely wish to call attention to the fact that two or three years ago, this society discussed the histologic conditions in carcinoma of the cervix and its relation to prognosis. I formulated our position at the Woman's Hospital in a very similar way to the one which Dr. Heyman has given us, namely, that prognosis is an enormously complex thing; that it depends upon innumerable factors, known and unknown; and that we do not think histologic prognosis feasible from a biologic standpoint. And, what is more important, we have not found, in our experience with any case treated at the Woman's Hospital by radium, that one is able to make a prognosis from the histologic picture alone, and when one considers that there is a combination of twenty or thirty factors or more that come into play, I do not think the cell type is a very highly important one. It is possible to make a histologic prognosis in a restricted number of cases but not in the majority of cases.

DR. HEYMAN' (closing).—In my opinion, success (and that is, I think, the main opinion of our Institute) is dependent on three factors which rank in importance in the order in which I shall name them:

First, the spread of the growth. We all know that there is a great difference in curing an inoperable and an operable case of carcinoma wherever it may be located.

The second one is the method of treatment. We have all had cases where patients died after radiologic treatment with heavy doses, for example, in carcinoma of the breast and carcinoma of the ovaries; and we all know that we can get marvelous results with another technic.

The third factor which enters into the proposition is radiosensibility. It merely is third in importance. I agree with Prof. Frankl and Dr. Plant that we can make a certain prognosis in a limited number of cases, but only if we are sure that the cases are equal to each other in the spread of the growth and if we are sure we treat them in the same way. Our experience with radiosensibility is not large enough to give any definite opinion on that question, because if you divide the cases according to the clinical aspect, the spread of the growth and the method of treatment and, finally, into the different histologic types, the results are not enough to prepare proper statistics.

It has been a great pleasure for me to visit New York again and to see the wonderful and interesting work that is being done in several of the clinics here. It is not necessary for me to tell you that the statistics of the Woman's Hospital today are about the best in the world and it is also unnecessary for me to tell you that many of the pioneering ideas in radiologic work emanate from the Memorial Hospital, whence we have taken most of the ideas for our organization.

PROFESSOR GEORGE W. BARTHELEMY.—In answer to Dr. Arrey's question with regard to the placental sign, the majority of tubal abortions are older according to the menstrual age than they should be, judging from the few human cases we have where the age of the pregnancy has been accurately determined. I think that is usually due to the fact that there is this placental sign which is interpreted in many instances as menstruation. It does come at the expected time and it is evidently controlled by the same machinery that controls the extravasation of menstrual blood. Corner has shown that typical bleeding may occur at the expected

In one of Dr. Hartman's publications he had a very significant note, to which I wish he had referred here, that is the interpretation of the eating of the placenta as done by the monkey and many other animals, and supposedly by a few human aborigines.

DR. L. B. ARREY.—I would like to inquire as to the probable correlation between the placental sign in the human being and the discrepancy in the menstrual reckoning as compared with the age of the fetus. If one studies the age in tubal pregnancies, he is immediately impressed with the relatively large number of fetuses which are too old for their menstrual age.

DISCUSSION

PROFESSOR CARL G. HARTMAN, Baltimore, Md., presented a paper entitled, *Reproductive Phenomena in the Monkey (Macacus Rhesus)*. (For original article see page 405, March issue.)

The second specimen was removed by Dr. Gilbertson from a patient forty-seven years of age, who came in complaining of pain in the vagina and discharge. She had a growth about the size of the terminal phalanx of the thumb involving the clitoris. There was also a tumor in the right labia. The diagnosis was carcinoma originating in the clitoris. This is the second case of primary carcinoma of the clitoris which Dr. Gilbertson has observed in the last ten years. There was one gland about the size of a hazelnut in the left femoral region, which on section proved to be a flat cell carcinoma. The entire vulva was removed.

DR. GILBERTSON also showed a *Primary Carcinoma of the Clitoris*.

This specimen was taken from a patient forty-eight years of age, who had a large ballovable tumor free in the abdomen. The diagnosis was ascites in addition to the tumor. The tumor was hard and gave the impression of being either a tumor of the ovary or a malignant fibrosarcoma. The patient had given birth to five children and was still menstruating. At operation two quarts of free fluid were found in the abdomen. The uterus, right and left appendages were found perfectly normal. The tumor was attached by a pedicle to the left broad ligament. Microscopic sections showed it to be a pure fibroma in the muscularis.

Broad Ligament.

DR. CAREY GILBERTSON presented a specimen of a *Fibroma in the*

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timo without any evidence of ovarian activity. That indicates that the mechanism controlling the cycle or rhythmical phenomenon of extravasation is independent to some extent of the ovary.

PROFESSOR H. B. VAN DYKE.—I would like to ask what fundamental basis, if any, is responsible for the establishment of estrus in animals that do not ovulate, such as the rabbit and cat.

DR. SIDNEY S. SCHOCHET.—I would like to ask Dr. Hartman whether there is any reaction from eating the placenta. So often you see a woman bleed about the eighth or ninth day after she is up and you wonder whether it is due to retained secundines.

DR. HARTMAN (closing).—I am glad to get Dr. Arey's and Professor Bartelmez's reactions on the age of the embryo. I want to study again Dr. A. W. Meyer's work on abortions as published in the *Transactions of the Carnegie Institute*, in which he has many thousands of measurements. As to the importance of the ovulatory sign, that is to say intermenstrual bleeding, I believe that it might be an index to the activity of the ovary. In cases of sterility where the gynecologist wishes to discover whether the woman's ovaries are functioning, that is to say whether the follicles are growing to a sufficient size to bring about premenstrual changes, curettage might determine whether there is a premenstrual condition.

As to the motility of the spermatozoa not indicating its fertilizing ability, there is a great deal to study on the relation of motility to fertilizing ability.

Concerning the eating of the placenta, there is no experimental work that corroborates the suspicion that it stimulates the mammary gland to secrete milk. All experimental studies have been negative.

As to the specificity of the hormones, the more we study the less we think of their specificity. One investigator who has been working with follicular hormone in the blood and urine of pregnant women, has found the anterior lobe hypophyseal hormone in the urine of newborn babies and of pregnant women and has come to the conclusion that the anterior lobe hormone is made in the placenta; that is to say, a substance like that has some action upon the immature mouse, stimulating the ovary of the immature mouse to become mature. We have always supposed that the hypophyseal hormone came from the hypophysis, but there is certainly something in the placenta that does the same thing.

Unlike the medical case which can be examined and reexamined by a group of medical students, the pregnant woman or the woman in labor must be treated with consideration and decency and is available for the instruction of but one or two students. Furthermore, the incidence of abnormality is so small, not more than 10 per cent at most, clinical facilities for its proper teaching.

Such a statement as this deserves more than casual notice. Why are we who are spending hundreds of millions of dollars in the erection of educational plants and hospitals, giving such inferior teaching and training in obstetrics to our undergraduate and postgraduate students. The underlying reason is that obstetrics has never been given a position in our medical curricula comparable to that given to medicine or surgery; while these have been major and allotted ample hours and bed space, obstetrics has never been accorded the time or adequate

What Is the Matter With American Obstetrics?

UNDER the date of February 20, 1930, the *Chicago Tribune* announced in headed type, "Yankees Behind Europe in Aid Given Mothers." It then goes on to say that our own progressive America is half a century behind Germany in the science and art of obstetrics. This latter statement was made by Dr. J. Whitridge Williams before the annual Congress on Medical Education and Hospitals of the American Medical Association. Dr. Williams said that "forty years ago when I was studying in Germany, there was a Woman's Clinic in connection with every University, presided over by a great clinical teacher. Compared with the graduates of these clinics, our practitioners are no better than first-class midwives, due to the inadequate teaching and training of our men. We are just beginning to establish women's clinics here. There is one in affiliation with the University of Chicago, although gynecology is not taught in conjunction with obstetrics there, as is the case in Germany. It would be better if the two were combined in one building under one head."

Editorial Comments

GEORGE W. KOSMAK, M.D., EDITOR HUGO EBRENFEST, M.D., ASSOCIATE EDITOR

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that there must be a large clinic from which to draw material to train the student in the diagnosis and management of abnormalities and accidents. However, in planning the average university hospital of two hundred and fifty beds the allocation is usually on a basis of 125 beds to surgery; 75 beds to medicine and the remaining 50 to obstetrics, gynecology, pediatrics, and the other specialties. With such an assignment what chance has a student to have even a midwife training?

Again, the selection of teachers has not been along the same lines as for teaching medicine, surgery, or pediatrics. In many schools a medical man without surgical training has been assigned to teach obstetrics, in others, young men just out of their residency have been placed at the head of the department, yet no branch of medicine demands such training, such experience and such skill. The obstetric teacher not only should be a good internist and pathologist with an understanding of bacteriology, serology and biochemistry, a mechanic with resourcefulness, a trained abdominal surgeon with a special understanding of pelvic anatomy, but should have a thorough knowledge of the art of infra-vaginal delivery.

We have been fortunate to have such leaders as Williams, DeLee, B. C. Hirst, Jeff Miller, Newell, Litzenberg, Lynch, the late Charles Jewett, E. B. Cragin, and others who at great personal sacrifice have developed clinics and trained men who have inherited the spirit of obstetric teaching. All of these received their inspiration from foreign study and that great maker of physicians, experience in general practice. A highly developed clinical sense has rightly been regarded as an essential attribute of the great physician. No one can teach what he does not know or what he has not experienced; the man who has spent his years only in the laboratory and hospital wards lacks the knowledge and ability to instruct his students in the art of medicine, which is an asset the general practitioner must have.

—John Osborn Polak

Erratum

In an article entitled *A Rapid Nonsurgical Procedure for Aiding Childbirth*, by Nicholas Temesvary, Budapest, Hungary, which appeared in the February issue of the journal, the first sentence of the last paragraph on page 269 should read "My own experiences with this preparation have since grown to more than a thousand cases."

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

The Obstetric Literature of 1929

By J. P. GREENHILL, B.S., M.D., F.A.C.S., Chicago, Ill.

THERE have been no startling advances in obstetrics during 1929 but a great deal of progressive work has been reported. Among the important contributions have been those dealing with the recovery of unfertilized human ova, the hormonal tests of pregnancy, especially the Aschheim-Zondek test, pulmonary tuberculosis complicating pregnancy, the effect of preconceptual and postconceptual irradiation on the newborn, anemia in pregnancy, the increased use of local anesthesia in obstetrics, and new therapeutic methods for treating puerperal sepsis.

PREGNANCY

Physiology.—Experiments on albino rats by V. Miyagawa and K. Saito¹ revealed that injections of corpus luteum of pregnancy produced characteristic changes in the uterus, vagina, mammary glands, and glands of internal secretion. F. Kubo² experimenting with rabbits came to the conclusion that the corpus luteum is not indispensable to the continuation of pregnancy.

It was the good fortune of J. P. Pratt, E. Allen, Q. U. Newell and L. J. Bland³ to obtain five human ova from the fallopian tubes during laparotomies. The ova were carefully studied, and the data obtained confirm the observation based upon the corpus luteum, that ovulation occurs most frequently at the middle of the intermenstruum.

In two articles S. Aschheim⁴ describes his method of diagnosing pregnancy by the demonstration of pituitary hormone in the urine. This hormone is found in every human being, but during pregnancy it is present in very large amounts in the circulating blood and it may be recovered from the urine during the first few days after a missed period. In a series of 296 pregnancies there was 97.7 per cent positive reactions. L. Kraul and J. Rippel⁵ used the Aschheim-Zondek test in 30 cases and consider it an absolutely reliable test of pregnancy. C. F. Pluhmann⁶ detected the presence of anterior pituitary substance in 55 out of 48 normal pregnancies. Six of the 52 controls gave a positive reaction but in all of these women, just as in the series of pregnant women, ovulation was suspended. E. Vogt⁷ describes in detail the technique of the Aschheim-Zondek test and discusses the results. H. Rössler⁸ obtained positive A-Z tests in seven cases of hydatid mole, three cases of mole combined with mild chorionepithelioma and three cases of advanced chorionepithelioma, and C. Otto⁹ obtained the Asch-

heim-Zondek reaction in two cases of chorionepithelioma. They agree with Aschheim that for many months after a hydatid mole is expelled or removed, the Aschheim-Zondek test should be repeated every month in order to detect a beginning chorionepithelioma. (There is no doubt that the experimental work of Aschheim and Zondek which culminated in the discovery of their test for pregnancy, represents one of the most illuminating contributions to obstetrics. A sufficient number of independent observers have corroborated the results of these two German investigators and their test has been found to be 98.25 per cent correct in 1600 cases.)

C. Mazer and J. Hoffman¹⁰ found varying quantities of female sex hormone in the urine of pregnant women as early as one week after the first missed period. They recovered this hormone from the urine in 61 out of 67 pregnant women. In this test, adult spayed mice are used and the female sex hormone reproduces estrus. In the Aschheim-Zondek test noncastrated infantile mice are utilized for the purpose of noting the effect of the anterior pituitary hormone on the ovaries and through them on the uterus and vagina. E. Philipp¹¹ found in the urine of newborn babies, a substance which is identical with the anterior pituitary hormone of Aschheim and Zondek.

It was reported that O. Pollatschek and R. Porges¹² devised a skin test for pregnancy which was said to be absolutely reliable. In the test the anterior hormone of the hypophysis was used. (In spite of the glowing report, inquiry from a number of individuals including the originators, elicited the information that this test is *not* reliable.) A. Mathieu¹³ discusses the following pregnancy tests: glycosuria, acetone, urobilinogen, skin test, the ninhydrin, flocculation and Aschheim-Zondek.

M. Douglass¹⁴ maintains there is a sign which can be recognized in the first month of pregnancy. If a finger is pressed firmly into the uterine musculature in the region where the Hegar sign will later appear, it will make a depression. If the finger is moved to the side and returned to the original point of pressure, the depression will be found to persist. (This sign is somewhat similar to Ladin's sign of pregnancy.)

Experiments performed by G. L. Kelly, C. B. Fulghum, T. W. Goodwin and W. A. Todd,¹⁵ showed that artificial insemination by way of the ovarian bursa in guinea pigs can be accomplished in about two-thirds of the trials. It is possible by this method to produce normal offspring born at the same time from one mother, but with different fathers.

It is the belief of H. Knaus¹⁶ that sexually mature women who have a regular four week cycle cannot conceive during the first ten days of the cycle and from the eighteenth day onward. The fruitful period during which conception can occur begins on the eleventh day and ends with the seventeenth day of the cycle. The optimum time for conception is from the fourteenth to the sixteenth day. (Theoretically these statements should be accurate but practically it has been found that many women can conceive almost any time in the menstrual cycle, including the actual period of bleeding.)

In an interesting paper, J. Hofbauer¹⁷ emphasizes the development in the outer layer of the human pregnant uterus, of a specialized structure whose typical microscopic features are in marked contrast with the rest of the uterine muscle and closely resemble the Purkinje system

of the heart. Hofbauer designates this system of muscle as the pacer-maker of the parturient uterus, analogous to the His bundle in the heart. H. Stieve¹⁸ gives an elaborate description of the musculature and connective tissue in the wall of the human uterus in the nonpregnant and pregnant states, during labor and in the puerperium.

According to P. F. Williams¹⁹ definite hypotension occurs in 5 per cent of pregnant women. Treatment uniformly fails to raise the blood pressure appreciably and the pregnancies are characterized by a high incidence of miscarriages and premature labor. The patients complain of effort—exhaustion, dyspnea, headaches and nervous depression. (This paper accurately describes a not uncommon condition. However, it must be remembered that normally the blood pressure of women during pregnancy is about 10 mm. less than in the nonpregnant state.) H. L. Cornell²⁰ analyzes the blood pressure readings of 1,000 pregnant women.

J. Halban and M. Z. Spitzer²¹ record the interesting observation that during pregnancy the finger nails grow about $\frac{1}{4}$ to $\frac{1}{3}$ faster than in the nonpregnant state. The rapid increase begins soon after conception and ceases suddenly after delivery. (This is in accord with the increase in body height in young gravida and the increase in the size of the pelvis.) J. W. Williams²² describes a new case of Naeglele pelvis which he believes was congenital in origin.

An interesting study of the topography of the bladder during pregnancy, labor, and the puerperium was made by E. V. Schuber²³ who filled the bladder with iodipin and then took x-ray pictures. An enormous change in the shape and position of the bladder is seen when the patient changes from the standing position to the dorsal one and from the dorsal to the ventral position.

From an extensive study, S. J. Fogelsohn²⁴ concludes that positive Graham-Cole gall bladder tests in pregnancy (failure to visualize) should be skeptically accepted as proof of gall bladder disease. Stasis in the gall bladder during pregnancy was not seen in the gall bladders visualized in his experiments. R. C. Cross²⁵ maintains that of all the liver function tests the bromsulphthalein test is probably the most helpful. It is invariably negative in normal cases, and if retention is shown complications should be sought.

J. Hofbauer²⁶ discusses the decidual formation on the peritoneal surface of the gravid uterus. Among the decidual cells he found unstriated muscle cells and he believes that he was dealing with two different structures, decidua and plain muscle. These develop from a single undifferentiated type which has retained its original mesenchymal potencies. J. Kowyer²⁷ reports a fatal case of intraabdominal hemorrhage at the end of pregnancy which was caused by decidual growths on the posterior wall of the uterus.

The relationship of basal metabolism to gestation is discussed by J. C. Litzenberg and J. B. Carey.²⁸ They found that nearly one-half of all women with a decreased metabolism were sterile and more than one-half of the sterile women had a subnormal basal metabolic rate. Restoring the basal metabolic rate to normal by thyroid medication and hygienic measures in many cases improves menstruation, permits conception and prevents interruption of pregnancy. Therefore in all cases where no other cause is found for abnormal menses, sterility, and abortions, the basal metabolic rate should be determined. (This is excellent advice.)

In cases where an advanced abdominal pregnancy is suspected A. M. Mendenhall²⁹ advocates that a roentgenogram be taken after injection of iodized oil into the uterine cavity. S. Sorrin³⁰ discusses the care of the teeth and supporting structures during pregnancy, and as helpful measures he recommends calcium lactate, orange juice, raw vegetables, milk, and the use of an alkaline mouth wash. (These are helpful recommendations.)

Abortion.—A review of the pathology of 104 consecutive miscarriages by J. L. Huntington³¹ shows that defective germ plasm is the chief cause of abortion. The author says that the obstetrician who, after an abortion throws away or fails to have examined by an expert the products of conception is guilty of negligence. (It is most unfortunate that the vast majority of physicians lack the scientific interest to send all abortions and ectopic pregnancies to some university laboratory where this material can be studied.)

According to I. B. Levit,³² legalization of abortion in Russia has had no influence on the number of abortions, for there has been neither an increase nor a decrease. However, legalization has brought about a decrease in the number of spontaneous abortions at the expense of artificial legal abortion. The same author³³ states that among 2,930 artificial abortions, perforation occurred only three times. In about 20 per cent of the patients, curettement was followed by chronic affections of the genitalia. X. Bronnikowa³⁴ concludes that artificial abortions while they seem to have no effect on healthy women have an unfavorable effect in subsequent labors. In a series of 60 autopsies where death followed criminal abortion, G. Strassmann³⁵ found five definite cases of air embolism.

The relationship of *Brucella abortus* and *Brucella melitensis* to pregnancy is discussed by E. L. Cornell and C. R. De Young.³⁶ Tests performed on the blood serum of 22 patients who had aborted gave negative results and in the one case where a positive test was noted in the aborted blood, it was negative in the venous blood. H. Vignes³⁷ emphasizes that Bang's bacillus is not responsible for many abortions in women.

In a discourse on artificial interruption of pregnancy H. Vignes³⁸ reviews the medical, eugenic and social indications. French physicians interrupt gestation for therapeutic purposes less than physicians of any other civilized country. K. Jensen-Carlen³⁹ treated 39 patients, who had habitual abortion without obvious cause, by rest in bed at the time of the expected menses and antisyphilitic treatment, even though there were no signs or symptoms of syphilis. There resulted 27 living children out of 39 pregnancies (69.2 per cent). (In some cases of habitual abortion the reviewer has found that the oral administration of mercury, iodine, arsenic, and iron helps patients to go to term.)

Complications.—E. D. Plass and W. A. Yoakam⁴⁰ found that during uncomplicated pregnancy the basal metabolism shows an increase of approximately 15 per cent and there is a fall to normal within the first few days after delivery. Iodine given prophylactically during pregnancy is apparently unable uniformly to prevent gestational hypertrophy of the normal thyroid gland but seems to be effective in preventing such a change in glands which are pathologically altered when pregnancy begins. F. H. Falls⁴¹ believes that the vomiting and toxic symptoms of an exophthalmic goiter during pregnancy are apt to be

wrongly diagnosed as hyperemesis gravidarum. He advocates bed rest and Lugol's solution as long as improvement occurs, withholding surgical intervention until it is evident that medical management has failed, or until the thirty-fifth week when premature delivery following thyroid operation will be harmless to the baby. In another article he⁴² states his reasons for opposing surgical treatment for hyperthyroidism during pregnancy. (Most obstetricians as opposed to some prominent surgeons agree with Falls that nearly all patients with hyperthyroidism can be carried through pregnancy under such conservative therapy as bed rest, Lugol's solution and sedatives. Most patients can safely go through labor but it is best to shorten the second stage where possible by a low forceps operation.) In a series of cases of simple goiter and Graves' disease complicating pregnancy, H. Gardiner-Hill⁴³ reports that miscarriage or premature labor occurred in 50 per cent. He attributes these bad results to shocks, mental stress and inadequate rest and treatment because where satisfactory conditions were attained and mental stress was absent the results were good.

During the past year many studies were made of anemia during pregnancy. C. E. Galloway⁴⁴ in two important articles shows that anemia develops in the majority of women during gestation and that it grows worse as the pregnancy advances. Fortunately there is a response to therapy in most cases. E. C. Lyon, Jr.,⁴⁵ found a hemoglobin of 70 per cent or less in 38 per cent of 200 obstetric patients whereas E. Jerlov's⁴⁶ incidence was 25.9 per cent for 1143 patients. It has previously been shown by P. B. Bland and L. Goldstein⁴⁷ that about 50 per cent of 200 maternity ward patients were anemic and that in most of the cases there was complete recovery soon after delivery. In the 50 cases reported in the present paper there was a decided improvement in 92 per cent of the cases a few months after labor. (The afore-mentioned authors deserve a great deal of credit for their efforts. There is no doubt that anemia is much more frequent in pregnancy than most physicians realize. Routine blood counts will soon be part of prenatal care. When anemia is found, treatment should be instituted by means of diet, iron, arsenic, ultra-violet light, and in some instances repeated intramuscular injections of whole blood or small blood transfusions. It is debatable whether it is proper to speak of anemia in pregnancy as "physiologic" when ordinarily it is an abnormal condition. The anemia may be due to a toxic substance which develops during pregnancy.)

Of the 244 maternal deaths which occurred among 11,343 labor cases in India, M. Balfour⁴⁸ informs us that 35.6 per cent were due to anemia of pregnancy. This anemia, however, resembles pernicious anemia but is distinguished by its sudden onset, rapid course and absence of remission. E. Husfeldt⁴⁹ and E. A. Björkenheim⁵⁰ each report a case of pernicious-like anemia in pregnancy.

In a symposium on the subject of pulmonary tuberculosis and pregnancy, A. Scherer⁵¹ pointed out the benefits of sanatorium treatment, and F. Klemperer⁵² maintained that interruption of pregnancy is sometimes necessary because pulmonary tuberculosis is occasionally dangerous for the gravid woman. Among 44 women in whom phthisis was evident during pregnancy or the puerperium, F. Schultze-Rhönhof⁵³ found upon subsequent examination that 21 were improved, in 10 the condition was unchanged, in 6 the tuberculous involvement was worse, and 7 women had died. In the cases where medical treatment fails to

bring about improvement R. Hornung⁵⁴ advocates vaginal extirpation of the uterus under local anesthesia. M. Beckman and A. Kirsch⁵⁵ believe that pregnancy should be interrupted only when there is danger and when the danger cannot be overcome in any other way. W. Hannes⁵⁶ favors termination of pregnancy in most cases where pulmonary tuberculosis complicates pregnancy. He believes with Auvaré that as far as tuberculous patients are concerned, a young girl should not marry, a married woman should not become pregnant, and a woman who has given birth should not nurse her baby. W. Roloff⁵⁷ maintains that pregnancy is no contraindication to pneumothorax. Among 600 pregnant women with tuberculosis A. Couvelaire and M. Lacombe⁵⁸ found 4 cases of tuberculous meningitis. (Most obstetricians take a conservative stand in dealing with pulmonary tuberculosis as a complication of pregnancy. The first thing an obstetrician should do is refer the patient to a specialist and let him care for the patient, disregarding the pregnancy as much as possible. Should interruption of pregnancy be deemed advisable it should be done within the first three months. Otherwise it is far safer to permit the patient to go to term. Under no conditions should a general anesthetic be given. Local anesthesia can be used successfully for all the necessary operative interventions both in early pregnancy and in labor.)

The management of cardiac complications during gestation is again discussed by H. E. B. Pardee⁵⁹ who emphasizes that the prognosis depends upon the functional cardiac diagnosis. This centers upon the patient's ability to perform physical exertion rather than upon the pathologic state of the valves or myocardium. The author says that as a method of interrupting pregnancy, the cesarean operation has seemed to produce very little additional heart strain, especially if it can be done under local anesthesia. P. B. Bland⁶⁰ is likewise of the opinion that for the pregnant woman who has a bad heart, cesarean section under local or spinal anesthesia is the procedure of choice. (At least 80 per cent of all cesarean sections can be successfully performed under local anesthesia. Pardee's paper contains excellent advice which should be carefully digested because heart disease is one of the most treacherous complications of pregnancy. The obstetrician should likewise refer these patients to a heart specialist.)

Diabetes as a complication of pregnancy is discussed by E. Holzbach,⁶¹ who reports an additional case where the fetal pancreas produced hormones which participated in the carbohydrate metabolism of the mother and prevented impending coma. R. D. Lawrence⁶² likewise reports a case where he attributes the improvement of diabetes in a pregnant woman to fetal insulin. M. G. Dill and A. V. Dill⁶³ successfully treated with insulin a pregnant woman who had diabetes. They maintain that the dangers associated with pregnancy and labor in diabetic women no longer exists. (This is an erroneous belief, because in spite of the great value of insulin, diabetes can still be a serious complication. As Hansen⁶⁴ pointed out last year, notwithstanding the administration of insulin there was an appalling death rate of 17 per cent among 23 pregnant diabetic women.)

An interesting article on neurologic symptoms in the pregnant woman is presented by C. W. Burr.⁶⁵ Among the illnesses considered are St. Vitus dance, epilepsy, hysteria, and Graves' disease. W. Haupt⁶⁶ maintains that in half of all the epileptic women who become pregnant, the mental condition becomes worse and in one-fourth there

is improvement, but the condition returns after the puerperium. Ten of the reported 19 patients died. H. Vignes⁶⁷ likewise believes that sometimes the number of epileptic attacks increases during pregnancy, sometimes it remains unchanged and at other times it diminishes in frequency. The same author⁶⁸ writes on the subject of chorea in pregnancy. In agreement with Burr, Vignes maintains that chorea during childhood does not necessarily imply a recurrence when the woman becomes pregnant. Vignes reports only one death among 53 pregnant women with chorea seen at the Baudeloque clinic, but the fetal mortality was 70 per cent.

According to A. Brindeau,⁶⁹ myomectomy during pregnancy yields good results for mother and child because the mortality is about 4 per cent and in 90 per cent the pregnancy continues to term. S. Liebmann⁷⁰ reports six cases in which myomas were enucleated during pregnancy. Four patients went to term. The author points out that if the immediate recovery after operation is uneventful, no complications need be feared during labor or the puerperium. R. H. Harris⁷¹ discusses the relationship of uterine fibroids to pregnancy.

The diagnosis, prognosis, and treatment of cancer of the cervix complicating pregnancy are discussed by J. A. McGlenn⁷² who reports two cases and K. Ihdima⁷³ reports 37 such cases.

An interesting paper on hookworm disease and pregnancy is presented by E. L. King⁷⁴ who observed this complication in 6.7 per cent of the obstetric patients admitted to the New Orleans Charity Hospital. This disease affects pregnant women unfavorably and the author treats these patients intensively.

F. Holtz,⁷⁵ basing his opinion on 1,306 cases of salpingitis says the common belief in the rarity of conception after salpingo-oophoritis is wrong. Among 807 who were not operated upon, 137 or 17 per cent conceived. If only those who could possibly conceive are considered the incidence of conception for the patients with sepsis was 31.2 per cent, for those with gonorrhoea it was 22.8 per cent, and for those in whom no cause for the salpingitis could be found the incidence was 25.4 per cent.

The Toxemias.—V. H. Harding and H. B. Van Wyck⁷⁶ found an increased percentage of serum protein indicating dehydration in most of their cases of vomiting of pregnancy. The same authors⁷⁷ observed urobilinuria in about 80 per cent of all their hospital cases of nausea and vomiting of pregnancy.

It is the belief of R. J. Crossen⁷⁸ that vomiting of pregnancy is due to deranged maternal metabolism, especially carbohydrate deficiency and should be treated by supplying food, fluid and salts. A series of 48 cases since 1921, with only one that did not yield to conservative treatment, shows that the therapy has been greatly changed since the introduction of intravenous glucose. E. L. Cornell⁷⁹ discusses the general treatment of hyperemesis gravidarum and C. H. Peckham⁸⁰ reports 60 cases observed at the Johns Hopkins Hospital. Peckham emphasizes that in most patients, isolation in a hospital and suggestive treatment will effect a cure, but exceptionally all therapy fails and the induction of labor is indicated. A considerable percentage of patients abort spontaneously. T. Nonaka⁸¹ claims to have cured 30 cases of pernicious vomiting by one injection of an artificially prepared antibody of human placental extract. (The reviewer wishes he could be

such a miracle man. He must, however, content himself with the customary treatment of this condition, namely, isolation, rest in bed, forced fluids, glucose intravenously and subcutaneously, sedatives, insulin rarely, duodenal feeding and by no means least of all, suggestion and psychotherapy. However, in spite of all these, pregnancy must occasionally be interrupted and we must be on the alert not to let the opportune time for this slip by.)

P. Titus⁸² discusses the disturbances in carbohydrate metabolism in the toxemias of pregnancy, and he explains nearly all the pathologic and clinical facts observed in eclampsia on the basis of glycogen deficiency. P. Titus and E. W. Willetts previously showed that eclamptic convulsions were almost invariably preceded by a sharp fall in blood sugar. This offered conclusive explanation for the beneficial effects of intravenous glucose injections in eclampsia. These authors⁸³ now find that it is not until the blood corpuscles are deprived of their sugar that a convulsion occurs and that the fluctuations as well as the convulsions can be stopped abruptly by morphine and intravenous administration of hypertonic dextrose solution which should be considered a specific measure. H. J. Stander and E. P. H. Harrison⁸⁴ undertook a detailed study of the blood sugar in eclampsia but they found hyperglycemia contrary to Titus and Willetts. Furthermore, Stander and Harrison are not convinced that glucose per se is a specific. They advocate conservative treatment and suggest the use of insulin with glucose for selected cases.

J. C. Hirst⁸⁵ summarizes our knowledge of the kidney of pregnancy and also reports cystoscopic and pyelographic studies made on 97 obstetric patients. He believes that vasodilatation and circulatory stasis of the distal ureter may directly or indirectly be concerned with late gestational toxemia.

An analysis of 801 cases of toxemia of pregnancy constitutes another paper by H. J. Stander⁸⁶ who divides the cases into five groups and outlines his treatment for each. F. H. Falls⁸⁷ treated 265 women with preeclamptic and nephritic toxemia without a single death. He believes that intensive prenatal care will practically wipe the disease out of existence. R. A. Johnston, H. W. Johnson and H. O. Nicholas⁸⁸ feel that infection plays a major rôle in the causation of toxemia and they advocate removal of all foci of infection. (There are many reasons for the belief that infection has something to do with eclampsia.)

E. Barzj⁸⁹ maintains that pregnancy toxemias are due to congenital hypofunction of the ductless glands, especially the thyroid and he says that the administration of thyroid is a preventive against eclampsia and always causes the complete disappearance of pregnancy edema. ("Always" is a strong word.) R. E. Lopez⁹⁰ reports good results in five cases of eclampsia from the use of parathyroid extract-collip.

The use of liver extract (heparmone) in the toxemias of pregnancy is praised by H. A. Miller and D. B. Martinez⁹¹ who report a series of 43 eclamptic patients with a mortality of 6.9 per cent. A. M. Mendenhall and D. L. Smith⁹² treated 25 toxemic patients with heparmone and found only one in whom there was any strong evidence of real benefit from this therapy. In view of the alarming symptoms produced by the heparmone, the authors discontinued its use. (Our experience with heparmone in eight cases has likewise been unsatisfactory.)

By injecting fibrinogen into the portal vein of dogs, W. J. Dieckmann⁹³ produced portal thrombosis and peripheral necrosis with hemorrhage. By means of biologic experiments on plants, P. Hüssey⁹⁴ was able to demonstrate the toxicity of the blood taken from eclamptic patients.

G. Baumgart⁹⁵ prevents eclampsia by putting patients to bed and giving them a three-day hunger and thirst cure. In the treatment of eclampsia O. H. Schwarz and W. J. Dieckmann⁹⁶ include the use of intramuscular injections of magnesium sulphate, colonic irrigations, gastric lavage, leaving 60 c.c. of a saturated solution of magnesium sulphate in the stomach, intravenous injections of glucose and karo syrup water after the stomach will empty itself. For the severe cases, the authors advocate emptying the uterus.

F. G. Du Bose⁹⁷ reports that in a consecutive series of 100 cesarean sections, over two-thirds of which were performed for toxemias of pregnancy and one-half for eclampsia, there were only two maternal deaths. In five eclamptic patients, a considerable amount of blood was withdrawn by F. C. Irving and J. V. Taylor,⁹⁸ the plasma was removed by centrifugalization, the corpuscles were washed and reinfused and all the patients recovered. A. Laffont and J. Larribère⁹⁹ praise the use of somnifène in eclampsia while F. Engelmann¹⁰⁰ favors the "middle line" therapy.

According to G. F. Gibberd,¹⁰¹ about 10 per cent of women who have toxemia of pregnancy later develop frank nephritis and bear the stigmas of this disease whether or not they become pregnant; about 40 per cent recover their kidney function completely and subsequently have normal pregnancies without albuminuria and about 50 per cent recover their kidney function only so far as to be free from signs of renal disease in the intervals between pregnancies. If they subsequently become pregnant, they suffer with recurrent albuminuria. A. Schmechel¹⁰² followed up 158 patients who had eclampsia. Of the 83 who became pregnant subsequently, 42 per cent had no symptoms of eclampsia, 40 per cent had preeclampsia and 18 per cent had recurrent eclampsia. C. H. Peckham¹⁰³ found that a surprisingly large percentage of eclamptic women have definite though relatively mild chronic nephritis a year or more after an attack. (In a follow-up of 60 patients who recovered from eclampsia the reviewer¹⁰⁴ found that 26.7 per cent of those who subsequently became pregnant developed signs and symptoms of toxemia. All recovered.)

Cases of ileus during pregnancy and pyelitis are reported by F. C. Hilgenberg,¹⁰⁵ P. Klein¹⁰⁶ and F. Sennewald¹⁰⁷ (4 cases). Hilgenberg believes that the intestinal paralysis was due to damage of the intestinal wall the result of retroperitoneal inflammation. W. Stoeckel,¹⁰⁸ however, maintains that the pyelitis was secondary to the ileus. He believes that from atonic intestines large numbers of colon bacilli can pass into the blood stream and that many bacilli may lodge in the kidneys and renal pelves due to stagnation in the atonic hydroureters. P. Klein¹⁰⁹ points out that if the renal parenchyma is involved in a case of pyelitis gravidarum, conservative treatment is ineffective. He believes that surgical intervention on the kidney is less dangerous than interruption of pregnancy because there is great danger of uterine infection and sepsis from pus in the urine. (This danger is not great.)

(To be continued in May issue.)

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Selected Abstracts

Cesarean Section

Moreira, Manoel-Antonio: Concerning Fifteen Cases of Elective Cesarean Section, and Eight Hebesteotomies. *Le Progrès méd.* 31, 1171, 1926.

The author reports 15 cesarean sections: 8 for pelvic disproportion, 3 for cicatricial contraction of the vagina, 3 for eclampsia and one for placenta previa. One patient of the first group, potentially infected, was lost but the baby saved. One of the eclamptic mothers died. The operation was performed as a conservative measure at estimated term or early in labor (membranes ruptured in only one case). The high incision was used in 12 and the low in 3 cases. The high incision is preferred. Exteriorization of the fundus was practiced in most cases to avoid peritoneal soiling.

Eight hebesteotomies were done: 5 on primiparae with rachitic pelves presenting a true conjugate of between 9 and 7.5 cm.; three cases measuring about 9 cm. presented additional dystocic factors. All of these patients had undergone rupture of the membranes, examinations, and even attempted forceps delivery from below. In order to save time, exposure of the bone by incision was not practiced but drainage was assured to avoid thrombus formation. Dilatation was completed manually and lateral incisions used where necessary. Delivery was completed by forceps or version. Pinard's belt was used postpartum. Death occurred in one case in which extreme shock was present on admission.

The choice between cesarean section and hebesteotomy should depend on the potential infection present. The author prefers hebesteotomy to all other methods advised for use in the presence of mild or potential infection. In the grossly infected cases section with total or subtotal hysterectomy should be practiced. Hebesteotomy should be avoided in cases with a true conjugate of less than 7.5 cm.

GOODRICH C. SCHAUFFLER.

Gröné, O.: Our Experience with Vaginal Cesarean Section at the Malmö Maternity Hospital. *Acta Obst. et Gynec., Scandinavica* 8: 83, 1928.

The author reports a series of 116 vaginal cesarean sections performed since 1907 in which the maternal mortality was 11.2 per cent. He points out that it is

easier to perform this operation late in pregnancy than early. In thirteen cases the peritoneum was torn during operation and all of these accidents occurred in the group of early gestations. Another complication of this operation is a hematoma between the bladder and the cervix. The author's conclusions are as follows: Vaginal cesarean section is superior in rapidity and precision to all other methods of widening the cervix for delivery. In abortions after the third month it is preferable to all other methods. It must be remembered that the operation can be technically difficult.

J. P. GREENHILL.

Gariipy: Systematic Compression of the Aorta During Cesarean Section. Bull. Soc. d'obst. et de Gynéc. 16: 584, 1927.

Gariipy advocates the systematic compression of the aorta with the hand during the performance of classic cesarean sections because it lessens the loss of blood. The maneuver is simple to carry out after the uterine contents have been removed. The author reports seven cases in which he followed this procedure but one patient developed a paraplegia forty-eight hours after the operation. The paraplegia however was transient and left no effect. The author says it could not have been due to the compression of the aorta.

J. P. GREENHILL.

Phaneuf, Louis E.: Cesarean Section Followed by Temporary Exteriorization of the Uterus—The Portes Operation. Surg. Gynec. Obst. 44: 788-794, 1927.

The largest field of usefulness for cesarean with temporary exteriorization of the uterus is represented under four conditions: (1) when frank infection is present, the child is living, and the condition of the pelvis is such that abdominal delivery is indicated; (2) in the presence of infection and of a dead child when delivery by the natural passage, if not impossible, is at least fraught with danger; (3) when any maneuver through the birth canal might result in the rupture of the uterus. The operation is indicated in such a case even though the child is dead. This applies especially in the neglected labor case with marked uterine retraction. In this type of case it is safer than craniotomy on a dead child, or even embryotomy, as either of these procedures performed within a retracted uterus may lead to rupture; (4) in the presence of a pelvic indication for abdominal delivery with fetal putrefaction and grave maternal infection.

The operation is done in two stages. The first stage consists in making a long abdominal incision, delivering the pregnant uterus, closing the abdominal wall behind it to the cervix, making a high uterine incision, extracting the child, placenta, and membranes, closing the uterine incision, and allowing the uterus to remain on the abdomen. This part of the operation is rapid and results in but little shock.

As far as the second stage is concerned, two methods may be used: First, if the patient does well, involution of the uterus is allowed to take place, and when the uterus is clean and the uterine incision well healed, the abdominal incision is re-opened and the uterus and adnexa are replaced in the pelvic cavity. Drainage is placed behind the uterus, and the abdominal wall is closed. If, on the other hand, the sepsis seems uncontrollable, a hysterectomy may be performed, extraabdominally, following the Porro technic, after the state of shock has passed:

The mortality in 32 reviewed cases was 6.2 per cent. The uterus was left extruding from fifteen to eighty-six days. One woman subsequently was delivered of a living child by a classic cesarean section. There is very little peritoneal reaction after the pelvic organs have been returned to the abdominal cavity.

WM. C. HENSKE.

Font, Indications and Technic of the Portes Césarean Section. *Rev. med. de Barcelona* 7: 4, 1927.

Font believes that the Portes cesarean section should be used in those cases in which it is impossible or exceedingly difficult to terminate labor through the natural passages. Second, in those cases in which the uterine cavity is already infected.

Font reports several cases in which this operation has been performed with most excellent results.

J. M. PIERCE.

Miller, H. E.: The Low or Cervical Cesarean Section. New Orleans M. & S. J. 79: 753, 1927.

The author has done 16 low cervical sections in three years. Chances of infection are fewer. It is the operation of election where there is danger of infection. In the author's 16 cases only three were frankly elective and in one instance there was a definite infection present before operation; yet there were no deaths as compared with two deaths in the last 16 classical operations. Convalescence is smoother as shown by clinical charts. The presence of the wound in the noncontractile area insures a stronger and more uniform scar and less danger of adhesions. The incidence of subsequent rupture is very low. The operation is not suitable for placenta previa.

GOODRICH C. SCHAUFFLER.

Constantinesco, M.: The Low Cesarean Section. *Rev. franç. de gynéc. et d'obst.* 22: 317, 1927.

The author reviews the literature and also 142 cesarean sections performed in the Strassbourg Clinic. Of these operations 16 were classic and 126 low, cervical. In the latter group the incision was extended into the corpus thirteen times. In this series the maternal mortality for the classic operations was 18.7 per cent and for the group of cervical operations 7.1 per cent. The fetal mortality for the two groups was 18.7 per cent and 6.3 per cent respectively. The maternal morbidity was practically identical in both groups (43.7 per cent and 42.8 per cent).

J. P. GREENHILL.

Jullien, F.: My Method of Performing the Low Cesarean Section by a Transverse Incision in the Lower Uterine Segment. *Rev. franç. de Gynéc. et d'obst.* 24: 204, 1929.

Jullien believes the transverse incision in the lower uterine segment has four advantages, namely, it is physiologic, it may be made at any level of the lower uterine segment, it does not require much stripping back of peritoneum and it does not encounter the placenta except in cases of placenta previa. The author performed 21 operations using the transverse incision and not one of the cases was "clean." In half of them the bag of waters had ruptured before the operation. There was one maternal death. In a series of 40 cases of cesarean section in which the author made a vertical incision in the lower uterine segment, there were no maternal deaths. In the former group the morbidity was low. All the children were born alive but two died, one on the second and the other on the fifteenth day. Both probably had hereditary syphilis.

J. P. GREENHILL.

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Original Communications

AN ANALYSIS OF 874 CERVICAL CESAREAN SECTIONS PERFORMED AT THE CHICAGO LYING-IN HOSPITAL*

By J. P. GREENHILL, B.S., M.D., F.A.C.S., CHICAGO, ILL.

(Attending Obstetrician, the Chicago Lying-In Hospital and Dispensary; Attending Gynecologist, Cook County Hospital; Associate in Obstetrics, Northwestern University Medical School)

THE performance of an increased number of cesarean sections has aroused great indignation, and warnings are repeatedly being sounded that the operation is being abused far too frequently. This is without a doubt true because the indications for cesarean section are often not carefully weighed, and many women are operated upon who should not be subjected to the risk of a laparotomy. On the other hand, some individuals want to extend the indications for abdominal delivery much further than is considered proper by most obstetricians. For example, Max Hirsch¹ of Berlin at the twentieth meeting of the Deutsche Gesellschaft für Gynäkologie in 1927 made a plea for an increase in the incidence of cesarean section as the best means to diminish the high maternal mortality which exists today. He advocated the substitution of cesarean section for all vaginal operative procedures except low forceps operations. His paper aroused a very lively and acrimonious discussion, and a large number of articles have been written in the German literature during the last two years in answer to Hirsch's arguments and statistics.

*Read before the Brooklyn Gynecological Society, November 1, 1929.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

In the present paper I have made an attempt to analyze all the cervical cesarean sections which have been performed at the Chicago Lying-In Hospital. This institution is an "open" one, and in addition to the attending staff about 140 outside physicians deliver patients in it. The first cervical cesarean section was performed at our hospital by Dr. DeLee on October 14, 1915, and from that day until July 1, 1929, the total number of these operations done was 874. In addition there have been 21 laparotrachelotomies followed by amputation of the uterus, but these are not included in my analysis because Porro operations and ruptured uteri should not be considered as ordinary

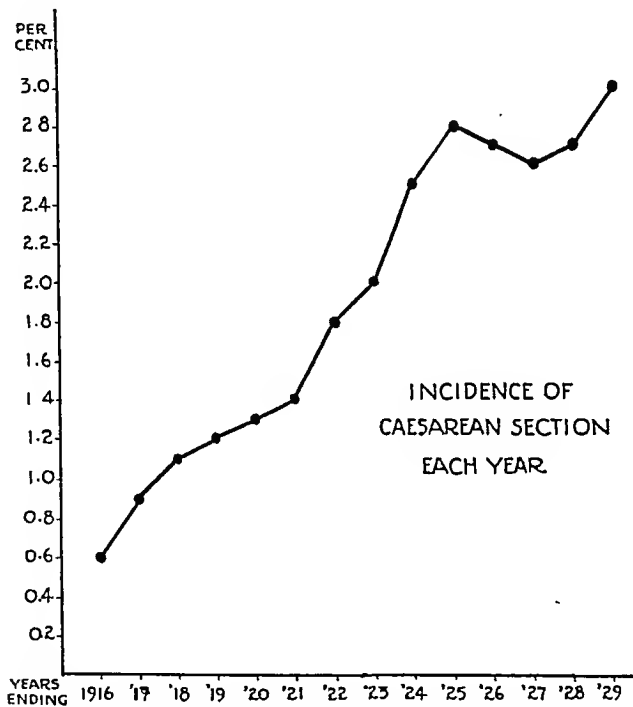


Fig. 1.

cesarean sections. During the same period of time there were 147 classic cesarean sections, and 17 additional classic operations were followed by removal of the uterus. The sum of all these abdominal deliveries is 1059. From July 1, 1915, to July 1, 1929, there were 32,797 deliveries in the hospital and 18,526 confinements supervised by our interns in the homes of patients. The latter patients are included in our statistics because all the out-patients who require cesarean sections, except the colored women, are sent to our hospital. Hence, among the 51,323 deliveries during the past fourteen years there were 1,059 abdominal deliveries, an incidence of 2.06 per cent, or one abdominal delivery among 48.5 patients (Table I).

TABLE I

No. of Deliveries in Hospital	July 1, 1915, to July 1, 1929	32,797
No. of Deliveries in Disp. Service	July 1, 1915, to July 1, 1929	18,526
		51,323
874 Cervical Cesarean Sections		
147 Classic Cesarean Sections		
21 Porro Operations after Cervical Cesarean Section		
17 Porro Operations after Classic Cesarean Section		
<hr/>		
1059 Operations		
1059 operations among 51,323 cases—2.06%		
or 1 operation among 48.5 cases		

In Table II the incidence of the different types of abdominal delivery is listed for each year from 1915 to 1929. The increasing popularity of cesarean section at our hospital is graphically shown in Fig. 1.

TABLE II

YEAR	TOTAL DE-LIVERIES	CLASSIC CESAR-EANS	CERVICAL CESAR-EANS	PORRO OPERATIONS	TOTAL CESAR-EANS	INCIDENCE OF ALL CESAREANS	DELIVERIES PER CESAREAN
1915-16	2430	9	6	0	15	0.6%	162.0
1916-17	2134	12	6	2	20	0.9%	106.7
1917-18	2895	20	10	2	32	1.1%	90.5
1918-19	3393	20	21	1	42	1.2%	80.8
1919-20	3268	28	14	1	43	1.3%	76.0
1920-21	3362	14	30	2	46	1.4%	73.1
1921-22	3683	10	54	1	65	1.8%	56.7
1922-23	3886	9	68	1	78	2.0%	49.8
1923-24	4042	4	93	3	100	2.5%	40.4
1924-25	4312	6	109	4	119	2.8%	36.2
1925-26	4350	3	109	7	119	2.7%	36.6
1926-27	4307	3	102	8	113	2.6%	38.1
1927-28	4658	5	120	3	128	2.7%	36.4
1928-29	4603	4	132	3	139	3.0%	33.1
Total	51323	147	874	38	1059		

More than 85 per cent of the 874 laparotrachelotomies were performed by the six attending physicians, and the rest were done by sixteen additional physicians, most of whom are adjunct attending physicians or were resident physicians at the hospital.

The total number of maternal deaths among the 874 laparotrachelotomies was 11, an incidence of 1.26 per cent (Table III). Details of

TABLE III. MATERNAL DEATHS

	MORTALITY
11 deaths among 874 cervical cesarean sections	1.26%
Including 21 Porro operations	1.23%
7 deaths among 147 classic cesarean sections	4.76%
Including 17 Porro operations	4.27%
0 deaths among 38 Porro operations	

these cases will be given later. The total number of maternal deaths among the 147 classic cesarean sections, which were performed essen-

tially by the same operators, was 7, an incidence of 4.76 per cent. The cause of death in these cases was toxemia of pregnancy 3, peritonitis 2, heart disease 1, and abruptio placentae 1. There were no deaths among the 38 patients on whom Porro operations were performed. If the Porro operations are added to each group, the maternal death rate is 1.23 per cent for the cervical group and 4.27 per cent for the classic cases.

The total maternal mortality for the 1,059 abdominal deliveries was 1.7 per cent. The total mortality at our hospital from all cases after all types of delivery was 0.246 per cent for a series of 23,136 cases delivered between July 1, 1918, and July 1, 1927. The total fetal mortality among the 23,372 babies which weighed 1500 gm. or over in this series was as follows:

TABLE IV. FETAL DEATHS IN 23,136 DELIVERIES

	NO.	PER CENT
(1) Stillbirths including dead before admission (3) and nonviable monsters (4)	522	2.2
(2) Stillbirths excluding dead before admission (3) and nonviable monsters (4)	164	0.7
(3) Dead before admission	270	1.15
(4) Nonviable monsters	88	0.37
(5) Neonatal deaths	357	1.5

REPEATED CESAREAN SECTIONS

In our series of cervical cesarean sections, 631 patients had one, 106 women had two, 9 patients had three and one patient had four of these operations. Hence 127 of the 874 operations were repeated ones, an incidence of 14.5 per cent.

INDICATIONS FOR OPERATION

The indications for the 874 operations are shown in Table V.

Since the majority of the patients who previously had a cesarean section had contracted pelves, at least 50 to 55 per cent of the 874 operations were performed for cephalopelvic disproportion. Nevertheless, this incidence for contracted pelves is far lower than is generally reported.

A relatively large proportion of operations was done because of the toxemias of pregnancy, namely 9.7 per cent for the cases without convulsions and 1.8 per cent for eclampsia. This is due to the fact that in most cases of toxemia without convulsions we believe in emptying the uterus under local anesthesia if medical treatment does not produce improvement. In cases of eclampsia the pregnancy is ended as soon after the first convulsion as possible. The method selected is that which is safest for the mother. Cesarean sections were performed on only 18.5 per cent of all our eclamptic patients, and the rest were delivered vaginally.²

Among the 85 patients operated upon for preeclampsia, one had convulsions during the operation and six had convulsions during the puerperium.

Hemorrhage was the next most frequent indication, since 4.8 per cent of the operations were done for placenta previa and 3.2 per cent for abruptio placentae. We prefer the abdominal route for most cases of central or partial placenta previa where there has been much loss of blood, regardless of the condition of the child. A blood transfusion is given before, during or after the operation, and local anesthesia is used. Most of the patients with abruptio placentae who were subjected to cesarean section had a severe form of this condition.

TABLE V. INDICATIONS

	NO.	PER CENT
Cephalopelvic disproportion	368	42.1
Previous cesarean sections. No test of labor	99	11.3
Previous cesarean sections. Test of labor	57	6.5
Toxemia without convulsions	85	9.7
Eclampsia	16	1.8
Placenta previa	42	4.8
Abruptio placentae	28	3.2
Dystocia dystrophia syndrome	43	4.9
A number of previous stillbirths	37	4.2
Cardiac disease	29	3.3
Dystocia due to soft parts	19	2.2
Malpresentation in old primiparas	12	1.4
Tumors blocking pelvis	10	1.1
Threatened rupture of uterus	8	0.9
Pulmonary tuberculosis	4	0.46
Exophthalmic goiter	4	0.46
Antefixation of uterus	2	0.23
Prolapse of cord	2	0.23
High amputation of cervix	2	0.23
One kidney with pyelitis in it	1	0.11
Malformed uterus	1	0.11
Psychosis	1	0.11
Intrapartum skull fracture	1	0.11
Previous myomectomy	1	0.11
Enormous edema of labia	1	0.11
Tuberculous meningitis	1	0.11
	874	

Dystocia dystrophia syndrome as an indication for cesarean section requires elucidation. The term dystocia dystrophia syndrome is applied to a group of patients who have the following characteristics: The patient usually conceives for the first time relatively late in life or has one or more sad obstetric experiences. She is usually a heavy-set woman with some masculine features. The external pelvic measurements are usually large, but the available space within the pelvis is somewhat smaller than normal, and the extremities are short. The vagina is narrow and rigid, and the cervix is short and relatively firm. There may be a family history of dystocia and the patient's own history may reveal abnormalities in the sex life. There is a tendency to

toxemia. The patient usually goes beyond term, and the fetal head which is hard and generally in an occiput posterior position remains above the pelvic inlet even after many hours of labor. The membranes often rupture before the onset of pains, and the latter are usually weak and irregular. When delivery is attempted from below, the result is frequently disastrous to the child and injurious to the mother. In view of this danger it is occasionally advisable to perform a cesarean section to deliver a living and uninjured child and to avoid serious injury to the mother.

A large proportion of the patients who had a few stillbirths had contracted pelves and rightly belong in the group with cephalopelvic proportion. The 29 operations performed for heart disease indicate that we favor this operation in patients seriously ill because of heart trouble. The remainder of the indications require no explanation.

DURATION OF PREGNANCY

The duration of pregnancy is given in Table VI. It will be noted that 74 per cent of the patients were at term and 9.8 per cent were

TABLE VI. DURATION OF PREGNANCY

	NO.	PER CENT
More than ten lunar months	86	9.8
10 lunar months	647	74.0
9½ " "	55	6.3
9 " "	44	5.0
8½ " "	9	1.0
8 " "	16	1.8
7½ " "	8	0.9
7 " "	8	0.9
6 " "	1	0.1
	874	

TABLE VII. DURATION OF LABOR

	NO.	PER CENT
Not in labor	437	50.0
In labor	437	50.0
Less than 2 hours	18	38.1
2-6 hours	59	
6-10 hours	67	
10-15 hours	92	
15-20 hours	53	
20-25 hours	44	9.3
25-30 hours	18	
30-35 hours	21	
35-40 hours	20	
40-50 hours	22	1.5
50-60 hours	7	
60-70 hours	6	
72-96 hours	10	1.1

overterm at the time of operation. Cesarean sections before the eighth lunar month were performed in less than 2 per cent of the cases.

DURATION OF LABOR

As may be seen from Table VII, exactly half of the patients were in labor when the operation was performed. The same table shows that 38.1 per cent of all the patients were in labor from 1 to 25 hours, 9.3 per cent had labor pains from 25 to 50 hours, 1.5 per cent were in labor from 50 to 70 hours, and 1.1 per cent had labor pains from three to four days before the cesarean section was performed.

CONDITION OF MEMBRANES AT TIME OF OPERATION

Table VIII shows that the membranes had ruptured in only 21.4 per cent of the cases before operation. The table also shows the time which elapsed between the rupture of the membranes and the time of operation in these 187 cases. In 13.7 per cent of all the cases from 1 to 25 hours elapsed, in 2.8 per cent from 25 to 50 hours, and in 0.7 per cent from 50 to 72 hours intervened before the operation was done. Vaginal examinations before operation were made on 81 patients (9.3 per cent) and the number of these manipulations varied from one to ten. In three cases forceps had been applied, in two cases gauze had been used to induce labor, in two cases labor had been induced with a colpeurynter, and in one case the cord had been manually replaced in the uterine cavity before the cesarean section was done. In an additional case where forceps had been applied, a Porro operation was performed.

TABLE VIII. CONDITION OF MEMBRANES AT TIME OF OPERATION

	NO.	PER CENT
Not ruptured	687	78.6
Ruptured	187	21.4
Less than 2 hours	8	13.7
2-6 hours	36	
6-10 hours	25	
10-15 hours	23	
15-20 hours	10	
20-25 hours	18	2.8
25-30 hours	7	
30-35 hours	4	
35-40 hours	4	
40-45 hours	6	
45-50 hours	4	0.7
50-60 hours	3	
60-72 hours	3	
4 days	1	Time not stated
5 days	1	
8 days	1	
	1	
	33	

PREVIOUS LABORS

The previous labors which were abnormal are listed in Table IX. It will be seen that 106 patients had one, 9 patients had two and one patient had three previous cervical cesarean sections. Furthermore 65 women had one, 2 women had two and one woman had 3 classic cesarean operations. The total number of patients who previously had laparotrachelotomies only, is 116; the number who had classic cesarean sections only is 70, and 4 had both types of operation. This gives a total of 190 women who had more than one cesarean section. The vast majority of the 74 classic operations had been performed in other hospitals. It is interesting to note that 167 patients previously gave birth to stillborn children or children which died shortly after birth, and on twenty-four babies a craniotomy had been performed.

TABLE IX. PREVIOUS LABORS

One cervical cesarean section	106	}	116	}	190
Two cervical cesarean sections	9				
Three cervical cesarean sections	1				
One classic cesarean section	65	}	70		
Two classic cesarean sections	2				
Three classic cesarean sections	1				
One classic cesarean section then forceps	2				
One classic and one laparotrachelotomy	2	}	4		
Two classic and one laparotrachelotomy	2				
Vaginal cesarean section	1				
Pubiotomy	1				
Dead babies	167				
Craniotomy	24				
Ectopic pregnancy	6				
Hydatid mole	1				

ANESTHETIC

The type of anesthetic employed is shown in Table X. Ether alone was used in 35.8 per cent of all the cases, novocaine alone in 55.1 per cent, novocaine with a small amount of ether or gas in 6.1 per cent, ethylene and oxygen in 2.6 per cent, and nitrous oxide and oxygen in 0.4 per cent. During the past year 92 per cent of all the operations were performed under local anesthesia.

TABLE X. ANESTHETIC

	NO.	PER CENT
Ether	313	35.8
Novocaine only	482	55.1
Novocaine and ether or gas	53	6.1
Ethylene and oxygen	23	2.6
Nitrous oxide and oxygen	3	0.4

From July 1, 1928, to July 1, 1929, 92 per cent of all the laparotrachelotomies were performed under local anesthesia.

ADDITIONAL OPERATIONS

Table XI shows what additional operations were performed at the time of cesarean section. Sterilization by means of an operation on the fallopian tubes was performed on 84 patients, or 9.6 per cent of all the patients. If the Porro operations are included, the incidence of sterilization is 11.7 per cent. Myomectomy was done 11 times, repair of a hernia 3 times, appendectomy twice, removal of an ovarian cyst once, and removal of a septum in the uterus once.

In the eleven cases where myomectomy was performed, the fibroids were not the indication for the cesarean section. We performed cesarean sections because of myomata of the uterus nine times altogether, but in all of the cases the fibroids were large enough to justify a Porro operation.

TABLE XI. ADDITIONAL OPERATIVE PROCEDURES

	NO.	PER CENT
Sterilization	84	9.6
If the Porro operations are included the incidence is	105	11.7
Myomectomy	11	
Repair of hernia	3	
Appendectomy	2	
Removal of ovarian cyst	1	
Removal of septum in uterus	1	

STERILIZATION

Of the 84 sterilization operations, 36 were done after the first cesarean section, which gives an incidence of 5.7 per cent for the 631 first laparotrachelotomies. There were 39 sterilization operations after the second cesarean section, an incidence of 36.8 per cent for the 106 second laparotrachelotomies, and 8 women, or 88.9 per cent, of the 9 women who had three laparotrachelotomies were sterilized after the third cesarean section. The patient who had four cesarean sections was sterilized after the last one (Table XII).

TABLE XII. STERILIZATION

	NO.	PER CENT
After first laparotrachelotomy (631)	36	5.7
After second " " (106)	39	36.8
After third " " (9)	8	88.9
After fourth " " (1)	1	100.0
	84	

The 36 women who were sterilized after the first cesarean section had the following number of living children including the baby delivered by laparotrachelotomy: 16 had one child, 10 had two, 4 had three, 3 had four, 1 had five, and 2 had six children. Of the 16 women who

had only one child, 11 were sterilized after the first full-term pregnancy, whereas the other five had had one or more stillbirths or neonatal deaths. The reasons for terminating the reproductive function after the first full-term pregnancy were as follows: cardiac disease 6, pulmonary tuberculosis 2, ventrofixation of the uterus 1, one kidney with pyelitis in it, and five previous laparotomies 1, and one patient forty-two years of age desiring sterilization.

MATERNAL MORTALITY

The total maternal mortality for the 874 operations was 1.26 per cent. Following are brief notes about each of the eleven deaths:

CASE 1.—Mrs. W., No. 7959, operated upon July 5, 1919, primipara, forty-two years of age. In labor sixty hours and membranes ruptured thirty hours. Blood pressure 204/138 mm. Weight 278 pounds. Disproportion between head and pelvis. Meconium escaping but fetal heart tones good. Laparotrachelotomy under ether done at request of patient for religious reasons. Bladder punctured during operation but closed at once and drained. Death from peritonitis four days after operation. No autopsy. Baby lived.

CASE 2.—Mrs. Z., No. 35059, operated upon April 4, 1924. Primipara, age seventeen years. Justo minor pelvis. In labor four days. Laparotrachelotomy under ether. Patient took anesthetic badly. Pneumonia developed first day after operation. Secondary peritonitis and septicemia. Died on eighth postpartum day. Autopsy showed bilateral hemorrhagic bronchopneumonia, acute pulmonary edema, acute bilateral diaphragmatic pleurisy and acute diffuse peritonitis. Baby lived.

CASE 3.—Mrs. J., No. 39758, operated upon Dec. 14, 1924, under ether. Primipara, age nineteen years. In labor two days. At time of operation blood pressure was 146/104 mm. and temperature 100.4° F. Large baby. Eight hours after operation temperature was 102.5° F. Signs and symptoms of pneumonia. Peritonitis followed at once. Abdominal drainage. Blood transfusion followed by jaundice, anuria and uremia. Death on tenth day. Baby weighed 4060 gm., lived.

CASE 4.—Mrs. S., No. 47438, operated upon under local anesthesia Jan. 10, 1926. Primipara, age twenty-six years. Considerable vomiting in early months of pregnancy. At time of operation eight months pregnant. Edema of ankles for last two months. Did not follow instructions. Entered hospital under protest. Blood pressure 180/110 mm. Urine turned solid on boiling. Headaches and mental aberration. Convulsions began forty-one hours after operation. Eleven convulsions in rapid succession with death twenty hours after first convulsion. Autopsy denied. Abdominal incision opened. No peritonitis. Baby alive.

CASE 5.—Mrs. M., No. 48105, a tertipara, age twenty-six years, had her third laparotrachelotomy on March 28, 1926. Novocaine, ethylene and ether used. Patient had bilateral phlegmasia alba dolens after first cesarean section and paralytic ileus after the second. Advised against further pregnancies. Prounced anemia and paroxysmal tachycardia during all three pregnancies. Immediately after third cesarean section, paralytic ileus and infection in abdominal wall. General streptococcus peritonitis. Death on eighth day. Autopsy showed uterus and cesarean wound to be perfectly healthy. General peritonitis most marked in region of

appendix, cecum and right cornua of uterus from which a portion of the tube had been resected for sterilization. Baby lived.

CASE 6.—Mrs. G., No. 51670, a primipara, age twenty-one years, was operated upon Aug. 13, 1926, under local anesthesia. No prenatal care. Entered hospital with blood pressure of 164/104 mm., marked albuminuria, enormous edema of legs and labia. Not in labor. Convulsions before and after operation. No peritonitis but general septicemia beginning apparently in whole operative field. Died on twelfth day. Partial autopsy. Blood cultures showed hemolytic streptococci. Baby alive.

CASE 7.—Mrs. C., No. 57924, a thirty-four-year-old secundipara had a laparotrachelotomy under local anesthesia for the second time on July 10, 1927. Weight 280 pounds, masculine pelvis, fibroids and extreme obesity. Membranes ruptured forty-eight hours before admission. Temperature of 100° F. at time of operation. Baby and cavity of uterus had foul odor. Baby had pustules on scalp and temperature of 102° F. at birth. It died of general sepsis on fourth day and mother died of peritonitis on fifth day.

CASE 8.—Mrs. D., No. 60514 and 60825, a primipara, age thirty years, had a laparotrachelotomy under local anesthesia on Nov. 27, 1927, because of abruptio placentae and a face presentation. Recovery was uneventful. The highest temperature was 100° F., and the patient left the hospital on the fourteenth day. Four hours after returning home, had pain in the right side of chest. Two days later temperature up to 103° F. Readmitted to hospital five days afterward. Mild elevation of temperature in hospital. After four days of normal temperature, got out of bed but died suddenly. Autopsy showed wound in uterus to be clean, pulmonary embolism in small accessory lobe of right lung and retrograde thrombosis into right side of heart. Source could not be found. Baby a monstrosity. Lived four weeks.

CASE 9.—Mrs. S., No. 62084, operated upon April 17, 1928, para vii, age twenty-six years. Cesarean section because of abruptio placentae, chronic nephritis and hypertension. Local anesthesia used. Fetus weighed only 1490 gm., and placenta had foul odor. In shock. Blood transfusion. Did well for a few days, then abscess developed in right iliac fossa. Opened abdominally and vaginally. Septicopyemia for six weeks. Autopsy showed infection of wound, well localized, also gangrenous appendicitis with a pericecal abscess, an abscess around the duodenum, and pelvic thrombophlebitis.

CASE 10.—Mrs. H., No. 70261, a primipara, age twenty-three years, was operated upon April 14, 1929. Entered hospital at term with history of severe headaches, anorexia, vomiting and emaciation. Treated for hyperemesis. Fever developed and condition grew worse. Laparotrachelotomy under local anesthesia followed by typical course of meningitis. Tubercle bacilli found in spinal fluid. Death on sixth post-operative day. Autopsy refused. Wound clean. Baby alive.

CASE 11.—Mrs. B., No. 70026, a primipara, age twenty-one years. Laparotrachelotomy on May 31, 1929, because of mitral and aortic stenosis and insufficiency and justo minor pelvis. Effective operation at term under local anesthesia. Temperature up to 102° F., thirty hours after operation. Pelvic cellulitis extending through rectum and involving whole pelvis during an illness of nine weeks. Free drainage. Three blood transfusions. Death from sepsis. Child alive but has mild hydrocephalus.

the development of pyelitis and most likely other renal complications. We have not infrequently observed that patients who have pyelitis during pregnancy develop symptoms of preeclampsia or eclampsia toward the end of gestation. In fact two of the patients in this series listed as having had pyelitis after operation had pyelitis during pregnancy, and in both cases the indication for the cesarean section was preeclampsia.

TABLE XVI. CAUSE OF FEVER (KNOWN IN 196 CASES)

	NO.	PER CENT OF 874 CASES
Infected wound	53	6.1
Pyelitis and cystitis	42	4.8
Bronchitis	18	2.1
Pneumonia (only one after local anesthesia)	11	1.3
Grip	9	1.0
Endometritis	8	0.9
Lochiometra	8	0.9
Peritonitis	6	0.7
Mastitis	6	0.7
Phlegmasia alba dolens	6	0.7
Laryngitis and tonsillitis	5	0.57
Breast abscess	4	0.46
Pulmonary tuberculosis	4	0.46
Cholecystitis	3	0.34
Abscess from hypodermic	3	0.34
Toxic erythema	3	0.34
Pelvic abscess	2	0.23
Hematoma in rectus muscle	2	0.23
Acute appendicitis	2	0.23
Sinusitis	2	0.23
Pulmonary abscess	1	0.11
Hyperthyroidism	1	0.11
	196	

The incidence of pyelitis at our hospital in cases not subjected to cesarean section is extremely low. Among 23,136 patients there were 104 cases of pyelitis and cystitis including those which followed cesarean section. This incidence is only 0.45 per cent. Tansinsin,⁶ however, reported an incidence of 2.46 per cent in 446 consecutive obstetric cases at St. Margaret's Hospital in Pittsburgh.

The frequency of bronchitis, pneumonia and gripe is not unusual. It is interesting to note that only one of the eleven cases of pneumonia followed the use of local anesthesia, in spite of the fact that local anesthesia alone was used in 55.1 per cent of all the cases. Three of the six patients who had peritonitis died (50 per cent). The other complications require no special discussion.

STAY IN HOSPITAL

Table XVII shows the length of time the patients remained in the hospital after operation. It may be seen that 46.7 per cent left the hospital within 14 days, and 84.6 per cent went home within 18 days.

TABLE XVII. STAY IN HOSPITAL

8 days	1	403 cases or 46.7%	730 cases or 84.6%
10 days	9		
11 days	24		
12 days	76		
13 days	123		
14 days	170	327 cases or 37.9%	
15 days	139		
16 days	84		
17 days	58		
18 days	46		
19 days	24		
20-25 days	60		
26-30 days	27		
31-35 days	6		
36-40 days	5		
41-50 days	5		
51-60 days	3		
61-70 days	2		
84 days	1		
	863		

FETAL MORTALITY

Since there were 13 twins, the total number of babies delivered was 887. There were 40 stillbirths and neonatal deaths, an incidence of 4.5 per cent. In Table XVIII the deaths are recorded according to the indication for the operation. Of the twelve deaths listed among the patients with cephalopelvic disproportion, 3 were due to atelectasis, 2 babies were monsters, 1 died of congenital heart disease, 1 of anemia, 1 of an infected umbilicus, 1 of enlarged thymus and in 3 cases the cause of death was unknown. Of the 7 deaths listed for those who had toxemia without convulsions, 5 were due to prematurity, 1 to congenital heart disease, and one baby had toxemia similar to that in the mother. There was not a single fetal death among the patients who had eclampsia. The causes of death in the 10 cases of placenta previa were prematurity in 4, atelectasis in 4, and 2 babies were

TABLE XVIII. FETAL MORTALITY ACCORDING TO INDICATION

INDICATION	NO. OF BABIES	FETAL DEATHS	
		NO.	PER CENT
Cephalopelvic disproportion	368	12	3.3
Placenta previa	42	10	23.8
Abruptio placentae	28	10	35.7
Toxemia without convulsions	93	7	7.5
Psychosis	1	1	100.0
Repeated laparotrachelotomy	129	0	0
Eclampsia	16	0	0
Cardiac disease	30	0	0
Dystocia dystrophia syndrome	43	0	0
Previous stillbirths	40	0	0
Total	890*	40	4.5

*Fourteen twins and one set of triplets.

monsters. (A few years ago I pointed out that the association of placenta previa and monstrosities was not an accidental one.⁷) In the cases of abruptio placentae, death occurred in utero before operation in nine instances, and the tenth baby had atelectasis. Prematurity was the cause of death in the baby born of the mother with a psychosis. There were no fetal deaths in the series of repeated laparotrachelotomies.

In Table XIX the fetal deaths are listed according to etiology and not according to the indication for cesarean section. All nine babies which died before the operation was performed were in the abruptio placentae series. The chief causes of death in the remaining cases were prematurity 25 per cent, atelectasis 20 per cent, monstrosities 10 per cent, and congenital heart disease 5 per cent.

TABLE XIX. ANOTHER CLASSIFICATION OF FETAL DEATHS

	NO. PER CENT		
Dead before operation	9	22.5	(All in cases of abruptio placentae)
Premature	10	25.0	{ 4 in cases of placenta previa 5 in cases of preeclampsia 1 in case of psychosis
Atelectasis	8	20.0	{ 4 in cases of placenta previa 3 in cases of cephalopelvic disproportion 1 in case of abruptio placentae
Monstrosity	4	10.0	{ 2 in cases of placenta previa 2 in cases of cephalopelvic disproportion
Congenital heart disease	2	5.0	{ 1 in case of preeclamptic toxemia 1 in case of cephalopelvic disproportion
Anemia	1	2.5	(In case of cephalopelvic disproportion)
Infected umbilicus	1	2.5	(In case of cephalopelvic disproportion)
Enlarged thymus	1	2.5	(In case of cephalopelvic disproportion)
Toxemia in baby	1	2.5	(In case of preeclamptic toxemia)
Unknown	3	7.5	(All in cases of cephalopelvic disproportion)
	40		

PORRO OPERATIONS

In Table XX some information is given concerning the 21 Porro operations.

All the mothers recovered and all the babies which were alive at the time the operation was performed left the hospital alive. The two fetal deaths were in cases of abruptio placentae. In 9 of the 21 operations the indication was fibroids of the uterus. In the two cases listed as abruptio placentae, the uteri showed uteroplacental apoplexy which made hysterectomy imperative. Some of the remaining indications may not seem justifiable ones; but since we know that a patient usually has an uneventful convalescence after a Porro operation, it is sometimes discreet to amputate the uterus in certain cases

where sterilization is contemplated. We have not been unduly radical, for in the series of 895 cervical cesarean sections (874 plus 21), the uterus was amputated in only 2.3 per cent of the cases. Eleven women were over thirty-five years of age, and whereas eight women had only one living child, each of the rest had from two to eleven children.

TABLE XX. 21 PORRO OPERATIONS

Maternal death rate	0	} Both deaths due to abruptio placentae
Fetal death rate (2)	9.5%	
<i>Indications</i>		
Fibroids		9
Abruptio placentae		2
Carcinoma of rectum		1
Mishandling with forceps		-1
Placenta previa in para vi		1
Placenta previa in para vii		1
Third cesarean section		1
Fourth cesarean section		1
Three almost fatal postpartum hemorrhages		1
Severe toxemia in two pregnancies		1
Cardiac disease with menstrual disturbances in a para vi		1
Second cesarean section with severe infection after the first one		1
		21
Eleven women were over 35 years of age. Parity varied from 1 to 11.		

VAGINAL DELIVERIES AFTER LAPAROTRACHELOTOMY

We do not know of a single instance where a patient had a rupture of the uterus following one of our laparotrachelotomies. On the other hand we have records of 22 vaginal deliveries after our operations. Among these, four patients have each had two vaginal deliveries after a cervical cesarean section, one patient had a vaginal delivery after two laparotrachelotomies and one patient had two deliveries through the vagina after two cervical operations.

ADVANTAGES OF LAPAROTRACHELOTOMY

The frequency with which the low or cervical type of cesarean section has been performed at the Chicago Lying-In Hospital indicates that it is the operation of choice when delivery is to be accomplished through the abdomen. In fact during the last eight years, the classic operation has seldom been performed except preliminary to a Porro operation.

We believe the cervical type of cesarean section is far superior to the classic type for the following reasons:

1. It has a decidedly lower maternal mortality. The mortality rate of the Chicago Lying-In Hospital is very low. I personally have performed 109 consecutive cervical cesarean sections, without a single maternal death.

2. The morbidity is also definitely lower. The decreased mortality and morbidity may be attributed to a number of factors. The incision after closure heals better because it is not in the contractile portion of the uterus but in the lower uterine segment which is at rest. The sutures need not be pulled tightly because they are used essentially for the purpose of approximation of the wound edges and not for hemostasis. The incision is covered over completely with peritoneum, which is a very important barrier against infection. The lower uterine segment resists infection better than the fundus. Perhaps one of the reasons for this is the presence of a large number of macrophages beneath its peritoneal covering and in the bases of the broad ligaments especially in the presence of infection as shown by Hofbauer⁸ and by Fluhmann.⁹

3. The cervical operation may safely be performed after a long test of labor, at which time the classic operation is fraught with great danger.

4. It guarantees a much greater protection against rupture of the uterus in subsequent pregnancies and labors. The incidence of rupture of the uterus after classic operations varies from 1 to 4 per cent, and a fair proportion of these accidents occurs during pregnancy when trouble is not anticipated. On the other hand, there have been reported in the entire world literature only 22 cases of rupture of the uterus after the cervical type of operation. All but three of these occurred during active labor. This is a negligible percentage of all the laparotrachelotomies performed all over the world.

In a study of 37 uterine scars removed from patients who returned for subsequent cervical cesarean sections, Bloom and I¹⁰ found that in most cases the wounds had healed well and that even in the cases where the scars were anatomically weak, they withstood the distention produced by pregnancy and the strain of labor. This is well exemplified by the fact that in our series of 874, as far as we know, there was not a single case of rupture of the uterus.

The technic of the operation as we perform it at the Chicago Lying-In Hospital need not be detailed here because it has already been described by Dr. DeLee¹¹ and by me.³ In all but four of the operations in the present series the longitudinal incision in the lower uterine segment was employed. In four cases the incision was made transversely. The operation is not much more difficult than the classic one, and its safety is still more enhanced by the use of local anesthesia.¹² Even Porro operations may be performed under direct infiltration anesthesia.¹³

SUMMARY

In this paper information is given concerning 1059 cesarean sections of all types which were performed at the Chicago Lying-In Hospital from July 1, 1915, to July 1, 1929. Since there were 51,323 deliveries

at this hospital and its dispensary services, the incidence of abdominal delivery for the last fourteen years was 2.06 per cent, or one cesarean section for every 48.5 cases.

The maternal mortality for the 874 cervical operations was 1.26 per cent. If the 21 Porro operations which were performed after a laparotrachelotomy are added, the death rate is 1.23 per cent. For the 147 classic cesarean sections, the mortality was 4.76 per cent and this is reduced to 4.27 per cent if the 17 Porro operations, which were done after a classic cesarean section, are added.

All of the figures quoted in this paper are gross figures. None of the statistics was "corrected." The following information is based only upon the 874 cervical operations.

The chief indications for the laparotrachelotomies were cephalopelvic disproportion 42.1 per cent, previous cesarean section with test of labor 11.3 per cent, previous cesarean section without test of labor 6.5 per cent, toxemia without convulsions 9.7 per cent, eclampsia 1.8 per cent, placenta previa 4.8 per cent, abruptio placentae 3.2 per cent, dystocia dystrophia syndrome 4.9 per cent, a number of previous stillbirths 4.2 per cent, and cardiac disease 3.3 per cent.

Only 50 per cent of the patients were in labor at the time of operation, and of these 38.1 per cent had labor pains between 1 and 25 hours, 9.3 per cent had pains between 25 and 50 hours, and 2.6 per cent had been in labor from two to four days.

In 21.4 per cent of the cases, the membranes were ruptured when the cesarean section was performed, and the interval between the rupture of the membranes and the time of operation varied from one hour to eight days.

Ether was the anesthetic employed in 35.8 per cent of the cases, novocaine alone in 55.1 per cent, novocaine with ether or gas in 6.1 per cent, ethylene in 2.6 per cent and nitrous oxide in 0.4 per cent. During the past year 92 per cent of all the cesarean sections were performed under local anesthesia.

Sterilization by means of operations on the fallopian tubes was performed in 9.6 per cent of all the cases. If the Porro operations are included, the incidence of sterilization was 11.7 per cent.

The cause of death in the 11 fatal cases was as follows: peritonitis 3, pneumonia (after ether) 2, sepsis 1, gangrenous appendicitis 1, pulmonary embolism 1, antepartum eclampsia 1, postpartum eclampsia 1, and tuberculous meningitis 1.

The maternal mortality according to the indications was as follows: cephalopelvic disproportion 0.8 per cent, repeated laparotrachelotomy 1.6 per cent, toxemia without convulsions 1.2 per cent, eclampsia 6.3 per cent, placenta previa no deaths, abruptio placentae 7.1 per cent, cardiac disease 3.4 per cent, and tuberculous meningitis 100 per cent.

Fever after operation was present in 43.4 per cent of the cases. The main causes of pyrexia in the 196 cases where the etiology was known, were infected wounds 6.1 per cent, pyelitis and cystitis 4.8 per cent, bronchitis 2.1 per cent, pneumonia 1.3 per cent, grip 1.0 per cent, endometritis 0.9 per cent and lochiometra 0.9 per cent.

In 46.7 per cent of the cases the patients left the hospital within fourteen days after operation and in 84.6 per cent they went home within eighteen days.

The fetal mortality according to the indications for the operation was as follows: cephalopelvic disproportion 3.3 per cent, repeated laparotrachelotomy no deaths, toxemia without convulsions 7.5 per cent, eclampsia no deaths, placenta previa 23.8 per cent, abruptio placentae 35.7 per cent, and psychosis 100 per cent. The chief causes of death among the 40 infants were as follows: dead before operation 22.5 per cent, prematurity 25 per cent, atelectasis 20 per cent, monsters 10 per cent, and congenital heart disease 5 per cent.

Among the 21 patients who had Porro operations there were no maternal deaths and two fetal deaths (9.5 per cent).

I desire to thank Mrs. G. H. Harries, registrar of the Chicago Lying-In Hospital for her valuable assistance in collecting data from the original case histories.

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185 NORTH WABASH AVENUE.

(For discussion, see page 698.)

OBSERVATIONS AND CONCLUSIONS ON PLASTIC OPERATIONS IN GYNECOLOGY*

BY RALPH A. HURD, M.D., F.A.C.S., NEW YORK, N. Y.

(From the Clinic of the Woman's Hospital of the State of New York)

IT IS my purpose to present in the paper which follows some of my observations and my practice in the performance of vaginal plastic operations in the clinic of the Woman's Hospital where I have been associated for the past eight years. The experiences encountered during this period have been most interesting and instructive, and I wish at the outset to acknowledge my genuine gratitude to the chief surgeon and to other senior members of the staff for the opportunity to study and compare their several excellent methods of work.

A thorough knowledge of the anatomy of the pelvic organs and particularly of their surrounding fascial structures is admittedly a prerequisite to the intelligent handling of all conditions where plastic repair is indicated. At the same time it cannot be denied that there has been an extraordinary amount of detailed and often confusing description of the musculofascial planes in this region. The result is that the beginner, and even the man of practical experience, is often despairingly confused when he undertakes their study.

Among the most lucid descriptions of these structures to be found in English may be mentioned the papers of Frank, Ward, Bissell and Goff and Farrar's chapter in the recent Kelly's *Gynecology*. All of these quote freely from the European observers, Martin, Tandler, Halban and others, and offer admirable illustrations. A perusal of these papers brings out the following facts which may be regarded as salient and quite indispensable to the discerning surgeon.

The two distinct systems concerned in the support of the female generative organs, as well as of the urinary bladder and the rectum, are the lower or supporting apparatus and the upper or holding apparatus. The first of these two groups consists of the levator ani and coccygeus muscles with their fascial investments and the triangular ligament in which is ensheathed the deep transversus perinei. This supporting apparatus, called sometimes the pelvic diaphragm, has been aptly likened by Frank to the shock absorbers in a mechanical device and, in my opinion, plays an important coordinating, but none the less minor, part in the prevention of prolapse of the uterus and vaginal walls. The major factors operating to control normal relations are the numerous musculofascial planes radiating in all directions from the upper part of the cervix, and it is to these structures that the term "holding apparatus" has been applied. This division Frank has again

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likened to an elastic sling or set of springs which maintains the uterus in labile equilibrium in the pelvis. These fascial planes include all the pelvic fascias which do not make investments for the muscle structures named above and are continuations of the endopelvic and in turn of the endoabdominal fascia.

This endopelvic fascia, so completely described by Halban, forms an investure for all the pelvic organs including bladder, vagina and rectum, and certain areas of it may be given distinctive names which serve to designate their locations. It seems to me that the most important of these special areas or layers are: (1) the vesicovaginal layer; (2) the cardinal or, better, the transverse cervical ligaments; (3) the rectovaginal layer; and (4) sacrouterine ligaments. The so-called cardinal ligaments are the numerous strong reduplications of endopelvic fascia radiating fanwise from the upper cervix to the lateral walls of the pelvis and are the strongest part of the holding sling. The other three divisions are situated in the regions which their titles would suggest. The round and broad ligaments are quite generally admitted to contribute little or nothing to maintaining the uterus at a fixed level in the pelvis, and if they function at all in this respect, their rôle is distinctly a subsidiary one. On the other hand the round ligaments play a major part in tilting forward the uterus and maintaining that organ in its normal attitude of anteversion.

The injuries incident to parturition are injuries of the various structures enumerated above, and according to the areas affected one is able to recognize the clinical conditions to which definite names have been applied. For the sake of classification and clearer thinking in dealing with the individual case one may bear in mind six distinct regions which are liable to injury and the six conditions which respectively are a result of defects in them. They are as follows:

(1) Injury to the upper anterior vaginal wall and its contiguous endopelvic fascial layer resulting in cystocele.

(2) Similar injury in the region of the lower vagina resulting in urethrocele which may be further complicated by partial or complete loss of bladder control.

(3) Injury of the musculofascial structures chiefly in the lateral parametrium (cardinal ligaments) resulting in descensus of the corpus or prolapse.

(4) Injury to the posterior vaginal wall and its endopelvic fascial investment above the perineal body resulting in rectocele.

(5) Injury to the pelvic diaphragm resulting in lacerations of the perineum which may be of various degrees of severity and involve any combination or all of the structures which go to make up the supporting apparatus. This type of injury may, of course, extend into or through the sphincter ani.

(6) Injury to the structures which operate to hold the postvaginal wall and rectum in contiguity resulting in a descent of the culdesac of Douglas and enterocele.

To summarize the above, therefore, one may recognize as the cardinal lesions in birth injury: cystocele, urethrocele and incontinence, descensus of the corpus or prolapse, rectocele, laceration of the pelvic floor and enterocele. It may here be emphasized that each of these conditions is a separate entity which may exist quite alone but which is more often seen in combination with one or more of the others mentioned. The proper surgical correction of any individual case must logically be a correction of each or as many individual lesions as appear in it. Thus one finds a group of several patients with similar complaints who on superficial inspection would seem to present similar conditions and, therefore, require similar repair. Upon analysis one will be found to require work only upon the anterior wall; another will need correction of a descensus plus a repair of a rectocele and will be found to have no cystocele at all, while a third will present little else than an enormous rectocele. Each of these women will require a different type of operation when the sum total of work is considered, but the elements of repair done to each may be precisely the same in so far as it goes.

In the concluding paragraphs of this essay there will be presented somewhat in detail an operation for cystocele which, although not original with me, seems to me to possess the greatest advantages of any it has been my privilege to observe and which may serve as a guide in the performance of vaginal plastic work in general. In the meantime it is desirable to indicate the operations best suited to correct the several lesions enumerated above, bearing in mind that these recommendations are the result of personal conclusions from observation and experience and that they may be subject to change or complete reversal in the light of further knowledge.

I. Cystocele. The operation for cystocele consists in laying open the anterior vaginal wall in its midline from the cervix behind nearly to the urethral orifice in front, thereby exposing the descended bladder which may be likened to the contents of a hernia. The bladder is next separated from the cervix and restored to its proper level, after which the anterior wall, by the same analogy likened to the sac of the hernia, is in part excised, and its resulting cut edges approximated. One should always work with the entire thickness of the vaginal wall and its contiguous layer of the endopelvic fascia and never destroy its integrity nor be content with mucous membrane denudation and infolding of muscularis. The so-called fascia lapping principle of Bissell and Rawls may be employed in many cases with attenuated vaginal walls where, by lapping the flaps in double-breasted coat fashion, additional thickness and security can be obtained. The inter-

position of the uterus between the anterior vaginal wall and bladder presents no advantages in the correction of simple uncomplicated cystocele and is distinctly abnormal anatomically in the end.

II. Urethrocele and injury to the urethral sphincter resulting in incontinence of urine have no universally highly successful method for their correction, and a fair proportion of failures is encountered even by the most experienced operators. Probably the best plan is that originally advocated by Kelly in which the bladder muscle in the area of internal urethral sphincter is reduplicated with mattress sutures of linen or catgut. A snug replacement of the previously dissected anterior vaginal wall is also a valuable adjunct in securing additional strength.

III. Descensus of the corpus uteri may be encountered quite alone, although it is much more often found associated with varying degrees of cystocele; and correction of the latter, although strictly speaking not an operation for prolapse, is often an indispensable link in the chain of repair. Although the types of operation for prolapse are legion, it would appear to the author that but very few have in any sense a wide scope of application. It may be mentioned here that surgeons at the Woman's Hospital place little or no credence in the worth of round ligament suspension operations nor, indeed, of any intra-abdominal procedures, such as the various types of corpus fixation in the treatment of prolapse. Depending upon the age of the woman and the degree of the displacement it would appear that most cases could be handled with one of three methods: (1) the interposition operation; (2) the Alexandroff procedure; (3) vaginal hysterectomy. The interposition operation is ideal, in my opinion, when the relatively rare case to which it is applicable is met. The prerequisites are obviously a patient in whom pregnancy is impossible and a relatively mild degree of prolapse, with or without cystocele, in a uterus that is neither too large nor too small to fit snugly beneath the pubic rami. The Alexandroff procedure demands a wide separation of the entire thickness of the vaginal walls from the cervix laterally to the so-called fixed line of the vagina and an upward dislocation of the bladder which results in the exposure of the cardinal ligaments described above. These cardinal ligaments which are the lateral reduplications of the endopelvic fascia lying at the base of the broad ligaments and running from the upper cervix to the lateral pelvic walls are approximated in the midline in front of and to the cervix with interrupted catgut sutures as described in most standard textbooks on operative gynecology. The importance of this area of tenacious musculofascial tissue cannot be overemphasized in any operation for prolapse where the uterus is neither to be removed nor interposed, as it is almost the sole source of support of the corpus. Better than either the interposition or the Alexandroff is vaginal hysterectomy which, when carefully

done with a clear working knowledge of the anatomy, yields a high percentage of successful end-results. The actual removal of the uterus in itself is naturally one of the least important steps in the operation, as everything depends upon the subsequent disposal of the supporting structures which remain. From my own observation I am of the opinion that the best results will be obtained in the following manner: First and of inestimable importance is the method of approach which will be described under a technic for cystocele. The space between the vesicovaginal layer of the endopelvic fascia and the bladder is entered near the cervix and the entire vaginal wall with attached endopelvic fascia reflected laterally after median bisection. The bladder is dislocated upward, and after entering the peritoneum in the anterior culdesac the uterus is delivered into the operative field as in doing an interposition operation. The uterus may now be removed from either above or below, but I prefer the Mayo method as modified by Ward and well illustrated in the latter's contribution in Kelly's *Gynecology*. Here the uterus is removed with clamps, three on either side, from above downward, beginning at the free upper margin of the broad ligament close to the corpus and advancing to the cardinal ligament area. After removal of the corpus the free edges of the broad and cardinal ligaments are united in the midline, and the peritoneum is closed. Although these structures are utilized by many as additional bladder support, the danger of foreshortening the vagina by so doing must be reckoned with, and the question arises whether attaching them to the pubic arch is a necessary or desirable procedure. It would seem that a deeper vagina will be secured if these structures are allowed to retract into the culdesac, especially since the anterior vaginal wall with its contiguous fascial layer is strong enough alone to give adequate support to the bladder. Indeed this is all that one finds in this location under normal conditions. The operation is completed by a careful readjustment of the reflected anterior wall flaps as in the case of cystocele. A repair of the posterior wall and a perineoplasty is almost always a required adjunct to the hysterectomy and improves the appearance of the end-result, even though it does not actually contribute to the support of the structures concerned in prolapse.

IV and V. Of the six primary lesions enumerated above, the fourth and fifth, namely injury to the posterior vaginal wall and to the pelvic diaphragm, resulting respectively in rectocele and perineal laceration, are so frequently associated as best to be dealt with together, although either may occur entirely alone. Of the numerous procedures I have observed in my own and other hospitals I am most logically impressed by and I practice exclusively, the method recently described by Byron Goff, one which has been practiced by him and several members of the staff for a number of years. As in anterior wall work great stress is again placed

upon entrance into the proper lines of cleavage, so that the entire thickness of the vaginal wall may be advantageously used. The importance of entering and following the natural cleavage planes had been stressed by Bissell in 1918 when he wrote on a fascial-lapping operation for rectocele. It is to be noted that the operative procedure under consideration seeks three distinct though closely related ends, namely correction of rectocele, restoration of the levators and reconstruction of the perineum. The desired result is obtained by: (1) incision of the rectovaginal septum; (2) removal of the rectum from the herniated portion of the rectovaginal septum; (3) excision of the herniated portion of the septum; (4) closure of the hernial opening; (5) denudation of the perineum; (6) replacement of the levatores ani and reconstruction of the perineum. Perusal of Goff's paper which is exceptionally clearly illustrated will give one an excellent working idea of the method. In cases where the rectocele is disproportionately large the retopexy of Ward may be used to advantage and the two procedures carried out in combination. It may be noted too that the method described is also admirably suited for the deeper lacerations with involvement of the anal sphincter simply by carrying the perineal denudation further downward and to the sides so as to reach the area of the retracted muscle ends. Our best results have been secured with silver wire.

VI. With the sixth and last lesion of the arbitrary group, viz., enterocele, I have had no personal experience, but because of the fairly high percentage of recurrences in the better clinics it would seem that the ideal operation is yet to be perfected.

The operation which I have selected to describe somewhat in detail is that for the correction of cystocele, which may, of course, be employed when this condition exists alone or as a part of more extensive work when there is coexisting prolapse, cervical disease, rectocele or laceration of the pelvic floor. The operation is a model of general procedure in other vaginal plastic work and is in most instances exceedingly simple to pursue, particularly if the initial steps are clearly understood by the operator and the desired line of cleavage is entered. Here it may again be stated as a cardinal principle that the entire thickness of the vaginal wall should always be left intact and so used in this work and that one should never be content, as pictured and vaguely described in many textbooks, to denude thin layers of mucous membrane and then to infold the remaining underlying structures of the vaginal wall with one or more tiers of sutures. By the latter method one cannot restore the bladder to its original level high on the cervix, nor can one correct the so-called weak spot which is the result of loss of contiguity between the lower cervix and anterior vaginal wall. In the actual performance of the operation the cervix is grasped with a volsellum and steadied under gentle traction by an assistant. Next a sound is inserted into the bladder, and the low point of descent of that organ is thereby determined and noted on the anterior wall near the cervix. Just below this point a scalpel is used to make a short superficial transverse incision on the anterior aspect of the cervix, involving if possible only the mucous membrane and amounting in length to about one-quarter of the circumference of the cervix at the level selected. Two Ahis or sharp-nosed Kocher clamps are next

placed on either side of the superficial incision in the midline, and the anterior wall is elevated in a small tent. With sharp straight scissors the operator next makes a generous cut along the line of scalpel incision and enters the space between the endopelvic fascial investment of the vaginal wall and the underlying bladder and cervix. This transverse approach to the clear space between the vaginal wall and the bladder was first demonstrated to me by Bissell, and it cannot be too warmly advocated because of its simplicity and its comparative freedom from the liability of bladder injury. Once this approach is effected, the entire vaginal wall with its thin adherent endopelvic fascial layer is bisected in the midline by easy stages forward almost to the urethral orifice. The forward progress of this incision is alternated step by step with blunt separation of the underlying bladder from the vaginal wall in front and the cervix behind. The gauze-covered finger can accomplish this alone in practically every case where the proper line of cleavage is entered, although one must occasionally employ sharp dissection to separate the bladder from the lower cervix or to progress through dense scar tissue. This alternate blunt dissection and bisection of the anterior wall are continued until the bladder is restored to its proper level high on the anterior aspect of the cervix and the wall flaps are freed laterally to the so-called fixed points of the vagina on either side. A semi-oval, corresponding to the redundancy produced by the cystocele, is now excised from the vaginal wall on either side, and the resulting cut edges are approximated in the midline with interrupted catgut sutures. It is recommended that the lowermost three or four of these be so placed as to include the underlying cervix and thereby prevent descent of the bladder at the so-called "weak spot."

When the vaginal walls are thin and attenuated, or as a routine with some, a double barrier against descent of the bladder may be secured by overlapping the lateral flaps in double-breasted coat fashion. This procedure, with the same principles in view albeit different in technic, has been described independently by both Bissell and Rawls of our clinic and has been rather inaccurately referred to as the fascia lapping method of repair. It has much to commend it and gives an extremely good account of itself in the follow-up observations, but it is not an operation for the inexperienced or unskilled in plastic work, since it requires nicety of judgment and exactness of technic to make a first-rate adjustment of the flaps.

In conjunction with the operation just described mild or moderate grades of descensus with slack in the transverse cervical ligaments may be eliminated by the Alexandroff procedure of plication, or the anterior culdesac may be entered and the corpus delivered and interposed between the bladder and anterior vaginal wall. For the severer types of prolapse the transverse incision on the cervix anteriorly is continued to make a circumcision, and a vaginal hysterectomy is performed. The latter procedure is effected by clamp and ligature from below upward in the hands of some, but it would seem to me as noted before that the uterus best be removed by clamps from above downward, three on either side being the required number in most cases.

Although the work upon the anterior wall has been particularly emphasized, it may be noted again that the same principles apply in the correction of rectocele, since the posterior vaginal wall bears the same relation to the rectum as does the anterior wall to the bladder. At a point just above the perineal body the posterior vaginal wall may be elevated tent-like in precisely the same manner, and the clear

avascular space between vagina and rectum be entered by a generous transverse sweep of the seissors.

When the term vaginal wall is used in the foregoing remarks, the author wishes to stress the fact that what is meant is the vaginal wall in its entirety, including the contiguous layer of the endopelvic fascia which is intimately adherent to it. This fascia is by no means a true fascia, if by that term is meant a structure in any way comparable to the fascia lata of the thigh or to the fascia which one employs in inguinal hernia repair. On the other hand it is a relatively thin layer of loose mixed fibrous and elastic tissue containing a large plexus of blood vessels and is possessed of very little tensile strength. One should not, therefore, endeavor to separate it from the strong muscle coats of the vaginal tube but should allow the entire vaginal wall to remain intact except where mucosa is denuded for the purpose of lapping.

Written authority often speaks of and skilled operators frequently demonstrate a strong and relatively thick plane of tissue, lying apparently between the walls of the vagina and the bladder, to which the term fascia is applied. With regard to this tissue I am of the opinion that it is not fascia alone but simply an artificially split off layer of the strong muscular coat of the vagina to which the thin and relatively weak connective tissue layer described above is attached.

Reference to genital fistulas and to injuries of the cervix have purposely been omitted in this review, and in closing it may again be stated that the component parts of the various operations enumerated here are in no sense original with me. They are, however, the procedures I have selected from many in a large special clinic and which I regard as the most logical and satisfactory from the standpoint of anatomic reconstruction and from the even more important standpoint of end-results.

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37 EAST SIXTY-FOURTH STREET.

(For discussion, see page 692.)

THE END-RESULTS IN TEN CASES OF HYDATIDIFORM MOLE TREATED BY CURETTAGE*

BY MARGARET CASTEX STURGIS, M.D., F.A.C.S., PHILADELPHIA, PA.

(From the Gynecological Department of the Woman's Medical College of Pennsylvania)

MY PURPOSE is to present the history and the end-results in ten cases of hydatidiform mole treated by instrumental and digital curettage. Eight of these patients were under my personal care in private practice and on the gynecologic service of the Hospital of the Woman's Medical College of Pennsylvania. I am indebted to Dr. Catharine Macfarlane and Dr. Emily Augé, each for one case. These ten cases occurred in the last ten years and have been followed very carefully.

In view of the variety of opinions expressed by recent writers regarding the incidence and treatment of hydatidiform mole, I was prompted to review all the cases of abortion which have occurred on the gynecologic services of the Hospital of the Woman's Medical College of Pennsylvania for the last ten years and the Woman's Hospital of Philadelphia for the past eighteen years. From a total of 1318 abortions, there were found 15 cases with hydatidiform mole. Five of these are excluded from the main subject of the paper because three were treated by hysterectomy and two could not be followed up. The incidence of 15 cases of hydatidiform mole in 1318 abortion cases is interesting, being 1.1 per cent or more than one in 100 cases. Gordon in 1923 reported 21 cases found from a study of the gynecologic records at the Bellevue Hospital, New York City, for the preceding eleven years. Since there were admitted to the hospital approximately about 4500 cases of abortion during that time, he concluded that there was an incidence of about 4 cases in 1000 abortions or 0.4 per cent.

Earlier statistics are based on the number of hydatidiform moles found among pregnancies. Madame Boivin in 1827 found that hydatidiform mole occurred once in 20,000 pregnancies; Gebhardt observed 12 cases in 16,000 pregnancies; Williamson found one case in 2400 pregnancies. More recently Velasco, in 1922, reported an incidence of one hydatidiform mole in 204 maternity cases.

This very high incidence of hydatidiform mole which has come under my personal observation makes it seem to me of vital importance that the profession should appreciate the comparative frequency of hydatidiform mole. The actual frequency must be even greater. Very early moles, without doubt, escape detection by the gynecologist and

*Read at a meeting of the Philadelphia Obstetrical Society, October 3, 1929.

TABLE I

DATE, AGE, NATIONALITY, AND COLOR	MARRIAGE AND GRAVIDARUM	PREVIOUS PREGNANCIES	LAST PREGNANCY	BLEEDING BEGAN	DURATION	SIZE	BLOOD COUNT	WASSER-MANN	OPERATION	COMPLICATION	IMMEDIATE RESULT AND DAYS IN HOSPITAL	APPENDICES	PATHOLOGIC REPORT	FOLLOW-UP
M. W. 9/20/18 30 American White	6 yr. 2 pregnancies	1 child 3 yr. of age	6/?	7 wk. later	3 mo.	To umbilicus	Not done	Neg.	9/20 Curet- tage	None	10 days in hospital. Discharged 9/30	No palpable enlargement	Not done	1 child 5 yr. Normal Menses regular Patient well
A. S. 9/28/21 38 Austrian White	12 yr. None	None	6/?	Bleeding since Aug.	3½ mo.	1 finger below umbilicus	Hb. 55% R.B.C. 3,030,000 W.B.C. 24,000	Neg.	10/6 Curet- tage	Mild sapremia on admission	19 days in hospital, 11 days in hospital after operation. Discharged 10/17	Left palpable mass size of tangerine	Hydatidiform mole. No evidence of malignancy (Meino)	Patient well, menses regular. 1 child born June, 1923. 1 child born April, 1927.
M. H. 9/18/22 39 Irish-American White	19 yr. 3 pregnancies	1st—16 yr. Living well. 2nd—3 mo. miscarriage 2½ yr. ago. 3rd—this one	6/13	8/1	3 mo.	4 fingers above symphysis	Hb. 70% R.B.C. 3,184,000 W.B.C. 8,800	Neg.	9/20 Curet- tage	Hemorrhage sepsis	Died 9/27/22	Not palpated	Hydatidiform mole. No evidence of malignancy (Meine)	Died 9/27/22
J. R. 1/28/23 25 American White	7 yr. 5 pregnancies	3 living children. Miscarriage 1922. Normal deliveries	8/7	11/4	5 mo.	4 fingers above symphysis	Hb. 75% R.B.C. 4,290,000 W.B.C. 8,050	Neg.	1/31 Curet- tage	None	13 days in hospital, 10 days in hospital after operation. Discharged 2/10	Not palpated	Hydatidiform mole. No evidence of malignancy (Meine). 1 liter of typically very bloody mole	Died Oct., 1923. Rush Hospital Acute Pulmonary T. B. Tubercle bacilli demonstrated in sputum. Examined prior to mole.

TABLE I—CONT'D

DATE, NATIONALITY, AND COLOR	MAR- PAGE AND GRAY- IDARUM	PREVIOUS PREG- NANCIES	LAST PREG- NANCY BEGAN	DUR- ATION	SIZE	BLOOD COUNT	WASS- ER- MANN	OPERA- TION	COMPLI- CATION	IMMEDIATE RESULT AND DAYS IN HOSPITAL	APPEND- AGES	PATHOLOGIC REPORT	FOLLOW-UP	
E. L. 9/28/23 22 Russian White	8 mo. None	None	6/22	7/22	3 mo.	To umbi- licus	Hb. 40%	Neg.	10/8 Curet- tago	Mild sapre- mia on admis- sion	26 days in hospital, 14 days in hos- pital after operation. Discharged 10/22	Not pal- pated	Hydatid- iform mole. No evidence of malign- ancy (Abbott)	Living in N. Y. Is well and has had 2 pregnancies since. Normal de- liveries. Normal children.
D. B. 10/7/23 22 Italian White	16 mo. None	2 preg- nancies 1 deliv- ery at 8 mo. lived 11 days "Would not nurse," Spon- taneous labor	7/19	9/15	3 mo.	4 fingers above sym- physis	Hb. 65% R.B.C. 3,860,000 W.B.C. 12,800	Neg.	10/8 Curet- tage	None	10 days in hospital. Discharged 10/17	Tender elastic mass in left side	Hydatid- iform mole. In sev. places cells with multi- ple large, deeply stained nuclei sug- gesting ma- lignancy (Abbott)	Baby born April, 1925. Mis- carriage, July, 1928 3 mo. Also Oct., 1927, 3 mo. Had curet- tage. Noth- ing abnor- mal reported
R. C. 5/10/25 29 American White	3 yr. None	None	1/20	4/10	4 mo.	To umbi- licus	Hb. 40% R.B.C. 2,160,000 W.B.C. 12,000	Neg.	5/14 Curet- tage	Hemor- rhage Grave sapre- mia and acidosis on ad- mission	25 days in hospital. Discharged 6/8	No pal- pable en- large- ment	Not done	1 child 11 mo. Normal delivery Normal child Patient well, menses reg- ular prior and since this delivery

TABLE I—CONT'D

DATE, AGE, NATIONALITY, AND COLOR	MARRIAGE AND GRAVIDARUM	PREVIOUS PREGNANCIES	LAST PREGNANCY	BLEEDING BEGAN	DURATION	SIZE	BLOOD COUNT	WASSER-MANN	OPERATION	COMPLICATION	IMMEDIATE RESULT AND DAYS IN HOSPITAL	APPENDAGES	PATHOLOGIC REPORT	FOLLOW-UP
C. D. 6/3/27 29 American White	10 yr. 4 preg- nancies	7 yr., 5 yr., 3 yr., living and well No mis- carriages Normal	3/21	5/21 Nau- sea and vomit- ing for 3 wks.	2½ mo.	1 finger below umbi- licus	Hb. 68% R.B.C. 4,160,000 W.B.C. 6,800	Neg.	6/8 Curet- tazo	Sapre- mia	15 days in hospital, 9 days in hos- pital after operation. Discharged 6/17	No pal- pable en- large- ment	Hydatid- iform mole (Meine)	Patient well No child since
M. B. 9/14/27 38 White	16 yr. 8 preg- nancies	16, 13, 11, 10, 5, 1½ All liv- ing and well 4 yr. ago had mis- carriage Others normal	6/30	9/4	2½ mo.	2 fingers below umbi- licus	Hb. 50% R.B.C. 2,670,000 W.B.C. 12,000	Neg.	9/14 Curet- tazo	Hemor- rhage	9 days in hospital. Discharged 9/23	Not pal- pated	Hydatid- iform mole. No evidence of malignancy (Ingleby)	Patient well, menses reg- ular, no pregnancy. Last few months had menses every 3 weeks. No clotting.
E. J. 11/14/28 44 Colored	27 yr. 7 preg- nancies	25, 11, 9, 7½, 6 All liv- ing and well Early miscar- riage 23 yr. ago	9/9	10/7 Had breast re- moved 24 yr. ago	2 mo.	To umbi- licus	Hb. 60% R.B.C. 3,450,000 W.B.C. 10,500	Neg.	11/15 Curet- tazo	None	9 days in hospital, 8 days in hos- pital after operation. Discharged 11/23	Round mass in left side about 4 in. in diameter	Hydatid- iform mole. No evidence of malignancy (Ingleby)	Patient well. Menses reg- ular. Mass subsided.

again by the pathologist. The search of recent literature reveals much concerning the unusual cases and the unusual treatment, but scarcely nothing on the simple statistical recording of the cases observed with the end-results of the treatment applied. Hence, this paper is to place on record the end-results of ten cases treated by simple curettage.

The age in this series ranged from twenty-two to forty-four years. Five cases were in the twenties, four in the thirties, and one at forty-four. All were white except one colored patient. Seven were American born; one was an Italian, and one an Austrian. These observations as to age, race, and color are not unusual. The mole was the first pregnancy in three cases, the second pregnancy in two, and the third in one case. One case was gravida iv; one gravida v; one gravida vii; and one gravida viii. Seven out of ten cases occurred in multigravidae.

Before considering the treatment, one must discuss the mortality attendant on placental degeneration from hydatidiform mole. Embryonic death rate invariably is about 100 per cent, so maternal mortality is the one consideration. The causes of death are generally given as hemorrhage, sepsis, perforation of the uterus followed by peritonitis, and chorionepithelioma.

Maternal death rate therefore has been variously estimated at from 10 per cent to 25 per cent. Findley, in his analysis, gives the death rate due to hemorrhage at 4 per cent; perforation of the uterus with peritonitis and general infections, 2 per cent; and chorionepithelioma, 16 per cent. The total mortality he estimates at 22.5 per cent. Williams gives 10 per cent to 26 per cent and Hirst 18 per cent to 25 per cent. Gordon had 9 per cent mortality in the Bellevue series. The one death in our series resulted from infection superimposed on a severe anemic state.

There exists a great variety of opinions as to the frequency with which chorionepithelioma follows hydatidiform moles. Gordon would reduce the percentage to a minimum, probably to less than one per cent. He bases this opinion on the experience of Dr. Doyles Symmers, director of the Bellevue Laboratories, whom he states did 8,000 autopsies at Bellevue Hospital in eleven years previous to his article in 1923 and examined more than 35,000 vaginal specimens and found but one chorionepithelioma.

The literature is full, however, of reported cases of chorionepithelioma. Bland writes in 1928 that there has been a total of 612 cases reported in the literature. How many of these cases followed hydatidiform moles is not stated. Teacher found 73 of his 188 cases of chorionepithelioma followed hydatidiform mole, 36.6 per cent. Polossin and Violet found 203 cases of their 455 to follow hydatidiform moles, 45 per cent; and Hirschmann and Cristofolletti found 48 per cent of their series followed hydatidiform moles. DeLee says that "notwith-

standing the textbook statement to the contrary, we have never seen in thirty-five years of special practice a chorionepithelioma follow upon a hydatid, though chorionepithelioma has been frequently observed following other conditions of the pregnant state."

In view of the danger associated with hydatidiform mole, as to the primary mortality as well as secondary malignancy, Schumann has advised opening the uterus by abdominal hysterotomy and removing the uterus, or sewing it up, if complete removal of its contents was possible. He relies upon whether or not the growth is confined to the endometrium on macroscopic examination; the presence of blood spaces indicating muscular invasion.

Williams considers this recommendation unduly radical and says that he feels sure that it will lead to the unnecessary sacrifice of many uteri. At the same time he does not disapprove of routine hysterectomy for this condition should it occur at the end of sexual activity. Bland likewise does not commit himself to so radical a procedure but rather advocates a careful curettement of the uterine cavity and relies upon the pathologic report as to the findings to determine further surgical treatment. "Any abnormal activity in the Langhans's cells should constitute the guide for further treatment" is his opinion. Cullen says that a "diagnosis of early chorionepithelioma cannot be made on curettings; a section of uterine muscle being absolutely necessary for diagnosis."

The treatment applied to all ten cases reported in this paper was a careful curettement, being assured, if possible, by a final digital examination that the uterus was clean at the end of operation.

A personal follow-up has been done with each case with the following summary of end-results. One immediate death from sepsis. One died nine months later in the Rush Hospital from pulmonary tuberculosis. A study of the records showed that tubercle bacilli were demonstrated in the sputum and that the disease existed prior to the hydatidiform mole. Five have been well over five years and have each had one or more normal pregnancies since the operation. Two have been well over one year. The last one was operated upon six months ago and is now well. No pregnancies have occurred in the last three more recent cases.

The only case reported suspiciously malignant after careful microscopic examination of the uterine contents refused to have further operative treatment. Since that time she has had a normal child born two years thereafter, April, 1925; and two miscarriages, one in October, 1927, and another in July, 1928, each of three months' duration.

My conclusions following this study are:

1. Hydatidiform mole occurs much more frequently than recorded.
2. Infection and hemorrhage are the most serious complications.

3. Delay in recognition and, therefore, delay in treatment increases the danger of primary mortality and adds considerably to morbidity from hydatidiform mole. All ten cases in this series presented some degree of sapremia on admission to the hospital and the one fatal case had sepsis.

4. Chorionepithelioma is a comparatively rare sequence.

5. A careful curettage in experienced hands is as safe as well as a conservative method of treatment for hydatidiform mole, especially in the young woman who still desires a family. Five out of this series of ten have had one or more normal pregnancies since the curettage. Three others are well and still retain their childbearing functions.

1930 CHESTNUT STREET.

(For discussion, see page 695.)

A TEST OF LABOR*

BY JOHN M. LAFERTY, M.D., PHILADELPHIA, PA.

(From the Obstetric Department, St. Mary's Hospital)

THE term "a test of labor" is ordinarily used to denote an indefinite period of expulsive pains which a pregnant woman at term is permitted to undergo in order to determine her ability to deliver her baby spontaneously.

There are no generally accepted rules for conducting such a test, the judgment of the attendant being the only guide.

A test of labor to be of value must indicate the time during the course of labor, when interference is necessary to save the mother or fetus from injury.

The rules for conducting a test of labor devised by Tweedy while master of the Rotunda in Dublin have been used in Dr. Lawrance's clinic at St. Mary's Hospital for fourteen years and have proved reliable in indicating correctly the time when interference was necessary.

Tweedy's rules are: First, determination of maternal pulse and temperature every two hours, or more often. Second, a count of the fetal heart sounds every two hours, or more often. Third, when the pulse and the temperature of the mother rise above 100° F., interference is indicated in behalf of the mother. Fourth, when the fetal heart sounds rise above 160 or fall below 120 on three consecutive counts at one minute intervals, interference is indicated in behalf of the baby.

These rules are easily carried out especially in a hospital where the nurses can very readily be trained to count the fetal heart sounds as well as to take the pulse and temperature. In the home either the nurse or even any ordinarily intelligent lay person can very quickly

*Read at a meeting of the Philadelphia Obstetrical Society, October 3, 1929.

TABLE I. THE PRIMARY AND SECONDARY COMPLICATIONS IN 822 LABORS

COMPLICATIONS OF LABOR IN 822 CASES GIVEN THE TWEDDY TEST	CASES WITH PRIMARY COMPLICATIONS		MATER- NAT. COMPLICATIONS DURING LABOR		RESULTS				GUIDED BY PRIMARY STATUS, OPERATION WOULD HAVE BEEN JUSTIFIED IN	GUIDED BY THE TEST THERE WERE				TOTAL FAILURES AND PERCENTAGE FOR EACH COMPLICATION	
	CASES WITH SEC. COMPLICATIONS	FETAL DEVELOPING	MOTHERS		BABIES		SPONTANEOUS DELIVERIES			OPERATIVE DELIVERIES		TOTAL CASES	TEST GUIDED CORRECTLY		TEST FAILED TO GUIDE
			PUR. MORBID	DIED	LIVED	DIED	TEST GUIDED CORRECTLY	TEST FAILED TO GUIDE		TEST GUIDED CORRECTLY	TEST FAILED TO GUIDE				
Contracted pelvis, 2nd and 3rd degrees ¹	134	86	22	21	1	126	8	95	78	75	3	56	52	4	7
Cardiac complications ²	13	9	0	0	0	13	0	70%	8	3	5	5	5	0	5
Primary inertia	25	12	4	2	0	24	1	100%	6	4	2	19	18	1	38%
Placental abnormalities	10	2	1	0	0	9	1	10	8	7	1	2	2	0	12%
Oligohydramnios	10	2	0	0	0	10	0	100%	9	9	0	1	1	0	10%
Totals	192	111	27	23	1	182	10	118	109	98	11	83	78	5	16
								61%			10%	43%			8%

¹Determined by pelvimetry and labor.

²Threatened rupture of compensation.

TABLE I—CONT'D

Cases developing secondary complications whose primary status did not show any ascertainable defect and hence not included above.

Postpartum hemorrhage	0	13	0	4	0	13	0	0	0	12	0	12	0	1	0	1	13
Maternal distress	0	4	0	0	0	3	1	0	0	0	0	0	0	4	4	0	100%
Secondary inertia	0	11	0	1	0	11	0	0	1	1	1	0	10	10	9	1	1
Fetal distress	0	0	11	0	0	11	0	0	0	0	0	0	11	11	10	1	9%
Totals	0	28	11	5	0	38	1	0	13	1	12	26	67%	23	3	15	38%

COMMENT

Number of cases with primary complications 192
 Number of cases with secondary complications alone 39

Total number of serious complications in 822 labors 231

Maternal mortality in these 231 labors was 0.43 per cent (cause of death was hepatitis following a cesarean section).

Maternal mortality in these 231 labors was 0.43 per cent (cause of the death was hepatitis following a cesarean section).

Fetal mortality, including stillborn, was 5 per cent.

In gross the test failed to reveal maternal or fetal distress in time or at all in 31 of the 231 labors or 13 per cent.

Thirteen of these failures were cases of postpartum hemorrhage all of which had had an anesthetic and hence might logically be excluded.

Five of the cardiac cases were considered failures because the heart muscle showed added damage after labor.

be shown how to count the pulse and fetal heart sounds and to take the temperature. There should be, however, a check-up of the accuracy of the count at intervals by the attending physician.

The only contraindication for applying the test is an elevation of the mother's pulse and temperature or fetal distress due to factors other than labor. The test is indicated in all labors except the relatively infrequent ones when the best obstetric judgment indicates that no labor should be permitted.

The advantages of the Tweedy test of labor are: First, it is scientific, being based on observed physical findings and not on individual judgments which are apt to be influenced by many extraneous factors.

TABLE II. TOTAL OPERATIVE INCIDENCE IN 822 LABORS GUIDED BY THE TWEEDY TEST

	GUIDED BY TEST									TEST GUIDED		
	TOTAL OPERATIONS	INSTRUCTION OPERATIONS	C. P. AND ABNORMAL PRESENTATIONS	PRIMARY INERTIA	CARDIAC AND CARDIORENAL	PLACENTA PREVIA	SECONDARY INERTIA	MATERNAL DISTRESS	FETAL DISTRESS	TOTAL OPERATIONS BY PRIMARY STATUS	CORRECTLY	FAILED
Operation probable by primary status			95	0	13	10	0	0	0	118		
										By test		
Forceps, low	54	6	25	3	5	0	9	3	3	48	46	2
Forceps, mid	30	3	15	7	1	0	0	1	3	27	23	4
Forceps, high	1	0	1	0	0	0	0	0	0	1	1	0
Cesarean section	11	0	9	0	0	2	0	0	0	11	11	0
Breech extraction	8	0	3	1	0	0	0	0	4	8	7	1
Version	17	0	6	7	1	0	2	0	1	17	15	2
Totals	121	9	59	18	7	2	11	4	11	112	103	9
Test guided correctly			53	17	7	2	10	4	10	103	103	
Test failed to guide			6	1	0	0	1	0	1	9		9
Totals			59	18	7	2	11	4	11	112	103	9

COMMENT

Total operative incidence in 822 labors guided by the test, 14¹/₁₀ per cent.

Operations for instruction (forceps) 1 per cent.

Forceps were used in 10 per cent of the 822 labors. (Only one high forceps.)

Versions 2 per cent " " " "

Cesarean sections 1 per cent " " " "

Breech extractions 1 per cent " " " "

The test guided correctly in 92 per cent of the 112 operative deliveries guided by the test.

In 118 of the 822 cases there was a primary status justifying operation or 14 per cent.

The actual operative rate under the test in this group was 8 per cent, a decrease of 6 per cent.

In 704 deliveries there was no primary status to indicate the need for operation but operation was found necessary in 44 cases or 6 per cent.

Second, it is easily carried out; nurses with few exceptions, being readily trained to obtain the necessary data accurately, and on several occasions lay persons have been able to count the pulse and fetal heart sounds and to take the temperature satisfactorily. Third, if the general practitioners were taught to use this guide and to rely on it, much unwarranted and pernicious interference with labor would be avoided and it would add greatly to their confidence in managing long tedious labors. Fourth, if the patient and relatives can be assured that the attendant has definite and accurate means of determining when interference is demanded, it relieves them of worry and uncertainty and spares the doctor a not infrequent cause of great annoyance. Fifth, the general adoption of such a standard test would enable us to compare more accurately the indications for the various obstetric operations.

The compilation of statistics to show the value of the Tweedy test of labor presents many difficulties, and so many factors have to be considered, that only a study of individual case reports could give a correct estimate of its true worth. There are, however, several ways by which its usefulness may be shown relatively. The first is by a consideration of the results obtained in the management of the complications of labor. (Table I.)

The complications of labor in this study are considered as primary when they are recognizable before or shortly after the onset of labor and secondary when they result from the labor and occur only as labor progresses. In some cases the secondary complications develop

TABLE III. MATERNAL MORBIDITY AND MORTALITY IN 822 LABORS GIVEN THE TWEEDY TEST

	PERIOD OF ORIGIN AS REGARDS LABOR						OPERATIVE DELIVERIES		TOTALS	
	BEFORE		IN		AFTER		L	D	L	D
	L	D	L	D	L	D				
Puerperal infections:										
(A) Septicemia										
(B) Parametritis										
(C) Peritonitis										
(D) Thrombophlebitis, etc.	4	1	5	1	0	0	3	1	9	2
Sapremia	0	0	33	0	0	0	16	0	33	0
Pulmonary	3	0	0	0	0	0	2	0	3	0
Neurasthenia	2	0	0	0	1	0	0	0	3	0
Mammary	0	0	0	0	2	0	0	0	2	0
Intestinal	2	0	0	0	0	0	0	0	2	0
Cardiac	2	0	0	0	0	0	0	0	2	0
Miscellaneous	5	0	0	0	0	0	1	0	2	0
Total morbidity	18	1	38	1	4	1	24	1	60	3

COMMENT

Total maternal morbidity (dead plus sick) 7.6 per cent old Rotunda Standard.
Maternal mortality was 0.0364 per cent, i.e., 3.6 deaths per 1000.

39 per cent of the morbid cases were operative deliveries.

33½ per cent of the deaths were operative deliveries.

In 19 of the 63 morbid cases the morbidity originated before the onset of labor.

as a result of the primary while in other cases either because of faulty examination or subtle masking no primary condition to account for the secondary complication is found. Hence in the table we have divided the complications into first, primary and their developing secondary complications, and second, the secondary alone.

Where there are primary complications there is frequently a primary status indicating operative interference. Therefore, we have also considered the cases from the standpoint of those having a primary operative status, and those having no primary operative status.

TABLE IV. FETAL AND INFANTILE MORBIDITY AND MORTALITY IN 822 LABORS GUIDED BY THE TWEEDY TEST OF LABOR

PRIMARY CAUSES	ORIGIN OF MORBIDITY IN RELATION TO LABOR OR TIME OF ADMISSION						TOTAL		RESULTS IN 822 LABORS	
	BEFORE		UNKNOWN		AFTER OR DURING		L	D	PER CENT MORBID	PER CENT DIED
	L	D	L	D	L	D				
Unknown	0	5	0	1	0	4	0	10	1.0	1.0
Weight under 5 pounds or pre-maturity	0	0	0	0	0	7	0	7	0.8	0.8
Congenital defects	8	0	0	0	0	5	8	5	1.5	0.6
Intracranial hemorrhage	1	1	3	0	12	9	16	10	3.0	1.0
Acute enteritis	0	0	0	0	0	1	0	1	0.1	0.1
Compression or hemorrhage of fundus	3	2	0	0	0	3	3	5	0.8	0.6
SECONDARY CAUSES										
Unknown	0	1	0	0	0	6	0	7		
Contracted pelvis	0	0	0	0	0	7	0	7		
Abnormal presentations	0	1	0	1	0	4	0	6		
Prolonged and precipitate labors	0	0	0	0	0	2	0	2		
Placental abnormalities	0	5	0	0	0	5	0	10		
Maternal toxemia	0	1	0	0	0	3	0	4		
Malena	0	0	0	0	0	2	0	2		
AGENTS										
Operations ill-chosen	0	3	0	1			0	4		
Operations, wise	0	0	0	0	0	9	0	9		
Trauma, external	0	1	0	0	0	0	0	1		
MORBID INFANTS										
Died neonatal		0		0		23		23		
Died intrauterine		8		1		6		15		
Lived	12		1		14		27			
Totals	12	8	1	1	14	29	27	38		

COMMENT

Total fetal morbidity (dead plus sick) 7.8 per cent.

Fetal mortality including stillborn, 4.6 per cent.

In 20 of the 65 morbid cases the morbidity originated before labor.

Eight of the babies died before the onset of labor.

The complications considered in Table I were all serious ones, the minor degrees of each complication being excluded.

The second way by which the value of the Tweedy test may be shown is by a study of the total operative incidence (Table II).

Tables III and IV show the maternal and fetal morbidity and mortality in the labors guided by this test.

The material used in compiling these tables is from the clinic of Dr. J. S. Lawrance at St. Mary's Hospital for the years 1922 to 1927 inclusive, a total of 822 cases, all of which were given the Tweedy test of labor.

CONCLUSIONS

1. The Tweedy test of labor has proved its value in fourteen years of careful clinical trial at St. Mary's Hospital of Philadelphia and has rarely failed to indicate distress of mother or fetus in time for proper interference to be carried out. It has frequently saved women from dangerous operative deliveries. A number of times it has indicated the need for interference when no such need was suspected.

2. It has shown very definite results in the management of the complications of labor. It failed to warn in time or at all in only 13 per cent of 231 serious complications of labor.

3. It had a very definite effect on the operative rate, positively by indicating the need for operation in 6 per cent of the cases where the primary status did not reveal any need and negatively by decreasing the operative rate 6 per cent in cases where the primary status would have justified operation.

4. It has been a factor of considerable importance in the production of a low maternal and fetal morbidity and mortality rate.

5. The confidence which the Tweedy test gives one in managing a labor, especially a long tedious case, cannot be shown statistically, but it is a very important benefit to the physician.

3658 FRANKFORD AVENUE.

CARCINOMA OF THE CERVIX COMPLICATING PREGNANCY. X-RAY THERAPY WITH THE BIRTH OF A NORMAL CHILD*

BY IRA I. KAPLAN, B.S., M.D., NEW YORK, N. Y.

(Attending Radiation Therapist, Bellevue Hospital; Director, Division of Cancer,
Department of Hospitals, New York City)

CARCINOMA of the cervix complicating pregnancy while not rare is of infrequent occurrence in obstetric practice. Carcinoma of the cervix in women of the Jewish race is very unusual; associated with complicating pregnancy, it is extremely rare. Katz of Vienna reports carcinoma of the cervix occurring in but 25 out of 82,825 total obstetric cases handled in his clinic.

During the past four years, of 119 cases of carcinoma of the cervix treated at Bellevue Hospital by radiation therapy there were but seven cases in women who were Jewesses. Vineberg reports nine such cases in 2,000 seen at Mount Sinai Hospital, in thirteen years.

Where pregnancy and malignancy coexist, the question arises whether to interrupt the pregnancy at once or allow it to proceed and then treat the local lesion. Toombs says that coexisting malignancy and pregnancy demands treatment of the former regardless of the fetus. As embryonic tissue is most sensitive to radiation, Nurenberg states that radiation during pregnancy is dangerous to the fetus, and this assumption is borne out by the observations of Regaud, Ewing, Russ and others. If we regard the fetus as the essence of embryonic tissue, then it as a whole should be most sensitive to radiation. Experimental results on animals are reported by Bagg, Penzoldt, Martius, Driessen and others to bear out this theory, although Robinson and Levine have shown some contrary results.

The x-rays, while in their action on isolated tissues are physically equal to the action of radium, do not seem to exert such a deleterious effect on the fetus when applied to the uterus externally through the body. In nearly all the cases where destruction of the fetus had occurred, radiation has been effected by direct contact with the radioactive energy source. Kane, however, reports a normal child born of a mother treated with radium without the presence of the pregnancy having been noted at the time of treatment.

Wyser and Mayer have successfully aborted numerous women with x-rays, and Zimmerman says that the usual dosage as given in the x-ray treatment of malig-

*From the Department of Obstetrics, Dr. Hervey Williamson, Director, the Department of Gynecology, Dr. Frederick C. Holden, Director, and the Radiation Therapy, Dr. Ira I. Kaplan, Director.

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nancy produces spontaneous abortions. Parkes claims that the termination of pregnancy is the most striking result of irradiation at that period.

Murphy in his review of the literature shows statistically the results of isolated cases of abnormal children born of irradiated mothers and, therefore, holds irradiation at fault; but abnormal children have been born of mothers never irradiated. Williamson, Döderlein, Rubin, Rongy, myself and others have reported healthy normal children born of mothers treated with x-rays for various gynecologic conditions.

In no instance among the vast number of cases radiographed for definite diagnosis at Bellevue Hospital has abortion occurred, or has an abnormal child been born of such an irradiated mother. Yet during this same period there were abnormal children born of mothers who had never been x-rayed. Murphy states that radiation in cases where future pregnancy is expected is contraindicated, but contrary to his conclusions normal offspring following irradiation of the mother have been reported by Rubin, Rongy, Smith, Bolaffio and myself.

Recently I reported the normal birth of a perfectly formed child of a tuberculous mother previously treated by x-rays for the interruption of a previous pregnancy, and for the suppression of the menses. Penzoldt states that normal offspring can be born of irradiated mothers provided the pregnancy occurs four months or later after radiation has been given.

The case herewith reported is one in which a malignancy of the cervix coexisted with pregnancy, and in which partial x-ray therapy was given with the idea of producing an abortion so that the local lesion could be better cared for by local irradiation.

Report of Case.—F. G., Jewish, age thirty-three years, married, born in Austria. Has had six previous pregnancies, five children, four living and one dead and one miscarriage. Admitted on the obstetric service of Bellevue Hospital, in November, 1928, with the complaint of persistent bleeding for three months beginning in July. She was not certain that she had been pregnant and miscarried in spite of the bleeding. The woman was very obese and abdominal examination was difficult. Vaginal examination showed a markedly irregular ulcerated cervix, bleeding easily on manipulation, and an early associated pregnancy was thought to be present, although on account of the obesity, a definite mass could not be felt. She was referred to the gynecologic service for opinion as to the presence of malignancy in the cervix, and then to the radiation therapy department with a positive clinical diagnosis of epithelioma. Examination and biopsy of the lesion showed the presence of a definite plexiform epithelioma.

In consultation with the gynecologist, we advised interruption of the pregnancy and subsequent irradiation for the malignancy. The patient refused operative interference and external x-ray therapy was commenced. The patient received but three doses of high voltage x-rays, 50 per cent of a skin erythema dose on the anterior and 25 per cent dose on the posterior pelvis and then disappeared. Frequent letters to her procured no response. On March 15, 1929, she returned to the obstetric clinic at Bellevue Hospital. Examination revealed a pregnancy of eight to nine months with a markedly ulcerated irregular granular cervix, bleeding on manipulation. The fetus in utero was alive in normal position and condition. The patient was advised to enter the hospital and have an operative delivery of the child

performed, she refused this advice. Nothing further was heard or seen of the patient until delivery May 2, 1929, at another maternity hospital where she had applied for assistance.

Unfortunately at this latter hospital the full significance of the condition of the cervix was not realized until the patient was in labor. An attempt at delivery through the cervical birth canal was made with the aid of dilatory bags. The patient had a prolonged and difficult labor during which the fetal cord prolapsed, and the child which was alive till then was suffocated in the delivery. The placenta was easily delivered; later there occurred severe hemorrhages from the severely lacerated cervix, which was with difficulty controlled by vaginal packing. On account of the loss of blood and the poor general condition of the patient, transfusions were given on the ninth and tenth days of May.

The baby weighed eight and one-half pounds, and was absolutely normal in form and size.

The patient was referred back to Bellevue Hospital twelve days postpartum; her condition was poor. Temperature 100.4°, pulse 100. Examination vaginally showed a markedly purulent discharge. There was moderate bleeding from the torn cervix, which was soft, spongy and granular. The tears extended to the lateral vaginal and the rectovaginal walls posteriorly. On account of the bleeding and the infection present it was deemed advisable to treat the malignant cervix only by a local radium applicator. This treatment was given by means of a modified "Colpostat" containing 45 milligrams of radium, placed up against the lacerated cervix. The vagina was packed and drained with iodoform gauze. A dose of 4300 milligram hours of radium over a period of four days was administered. There was only a slight reaction in the way of temperature; the patient bore the treatment very well. When the radium was removed, no bleeding occurred from the cervix. Two days later a radium sound containing 30 milligrams of radium was inserted into the uterus, and 2880 milligram hours of radium treatment were given over a period of two days. The patient reacted well, having slight distress and no rise in temperature.

Three days following the radiation treatment, the patient began to bleed per vagina, which in spite of packing persisted throughout the night. Transfusion was given and a dose of high voltage x-rays to the spleen. The packing meanwhile had begun to control the bleeding. During the following four weeks the patient had recurring hemorrhages whenever the packing was removed, which necessitated frequent transfusions being given.

At present (November, 1929) the patient is in good condition, carrying on her household duties and has gained thirty pounds in weight. The local condition of the cervix is completely healed.

CONCLUSIONS

Coexisting malignancy and pregnancy is an unfavorable condition and requires immediate termination of the pregnancy, followed by radiation treatment.

Radiation given knowingly or unknowingly during pregnancy is not always followed by abortion.

Radiation so given usually is fatal to the fetus in utero, but normal children may be born following partial radiation through the mother.

Abnormalities in children born of irradiated mothers may be due to other sources than the irradiation.

Delivery of the fetus in carcinoma of the cervix should be by operation; delivery via the cervix is contraindicated.

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55 EAST 86TH STREET.

 ERGOTISMUS GANGRENOSUS*

BY PHILIP OGINZ, M.D., F.A.C.S., BROOKLYN, N. Y.

THE use of ergot in any form, both in hospital service and private practice, generally is not associated with untoward reactions. Rarely if ever does the physician give the matter of its toxicity any consideration as he does in the use of other drugs, such as quinine or the salicylate group, for cases of ergot poisoning with serious consequences seldom occur. Obstetricians of great experience almost never meet during a lifetime of service, with a single case of ergot poisoning, and yet a review of the literature reveals that such cases do occur, and more frequently than is generally supposed. It is not unlikely that some cases of supposed puerperal gangrene brought to the operating table for surgical treatment are in reality cases of ergotismus and manifestations of an idiosyncrasy to the drug.

The case here to be reported was caused by the administration of an ergot preparation, ergotamine tartrate, or "gynergen," as commercially called. The case was one of puerperal sepsis and its treatment 45 ampules of 0.0005 gynergen, one ampule every four hours was administered during a period of fourteen days.

Gynergen is the tartrate of the alkaloid ergotamine. It exerts in a profound manner all actions characterizing ergot. Unlike pituitary extract, it does not intensify uterine contractions already existing, but induces a continuous uterine spasm, which, though dangerous during

*Read at a meeting of the Brooklyn Gynecological Society, October 4, 1929.

the period the fetus or placenta is in utero, is nevertheless exceptionally desirable during the puerperium. The effects of gynergen appear to be more lasting, in contrast to the fleeting action of histamine. As a remedy in the treatment of postpartum hemorrhage to maintain firm and prolonged contractions, this specific alkaloid is apparently of more value than is pituitary extract.

CASE REPORT

P. F., a primipara, aged nineteen, of ample pelvic measurements and negative history, was admitted while in labor to the Brownsville and East New York Hospital on July 3, 1927. Her last menstrual period occurred on November 10, 1926. She delivered spontaneously, nine hours after onset of labor, of a normal living premature seven and a half months' infant. There were no lacerations, and the placenta was removed intact without subsequent hemorrhage. No anesthesia was used.

As routine, one dram of the fluid extract of ergot was given every four hours, for four doses; she received no further medication. The condition of the patient the day after delivery was good, and continued favorable until the evening when a large uterine clot was expelled. An hour later she suffered a chill lasting one-half hour which was soon followed by a temperature of 104° F. Measures usually employed for such conditions were ordered and a mild sedative given for the night. The next morning an examination revealed the following: The abdomen soft and nowhere sensitive; the uterus at the umbilicus, no rigidity but somewhat tender on deep pressure. Vaginal examination disclosed profuse red lochia with some clots but no odor; the vaginal vault and perineum intact. The cervix was in the proper axis, not lacerated; the external os readily admitted a finger; fornices and culdesac negative. A gynergen ampule of 0.0005 mg. subcutaneously was ordered every four hours for the conditions disclosed.

The patient's condition however, became increasingly worse. Chills appeared and recurred with great frequency. A glance at the temperature chart will reveal the seriousness of the condition. The persistent sepsis demanded radical measures and intravenous therapy, blood transfusions, etc., were prescribed.

In the early morning of the tenth or one week after labor, the condition of the patient remained unimproved. By this time she had received a total of 25 c.c. of gynergen and 6 drams of fluid extract of ergot. Toward noon of this day the upper and lower extremities became cold and cyanotic and the pulse very weak; the nails and toes were markedly cyanotic. In the evening, the pulse became weaker, thready, and at times imperceptible. At ten o'clock after another 2 c.c. of gynergen had been given, *radial pulse disappeared entirely*. The heart sounds were of very good quality, action regular, and adventitious sounds none; that cardiac state seemed contradictory to the character of the pulse and the state of the extremities.

On the following day, the eleventh of July, in spite of repeated stimulation, the radial pulse failed to return. On the twelfth, two days after the disappearance of the pulse, the patient complained of pain and stiffness in the big toes of both feet. The extremities were cold, the right foot cyanosed; there was numbness in all toes and tingling sensation in all fingers; external heat was applied in the hope of securing relief—but to no avail. Throughout these days, the blood pressure remained in the neighborhood of 100/60, blood cultures were consistently negative, blood counts showed a progressive anemia and temperature persisted high.

On the thirteenth with medication continued as heretofore, patient complained of severe pain in all toes especially of the right foot, morphia had to be administered. The radial pulse remained imperceptible, and the extremities cold. In the after-

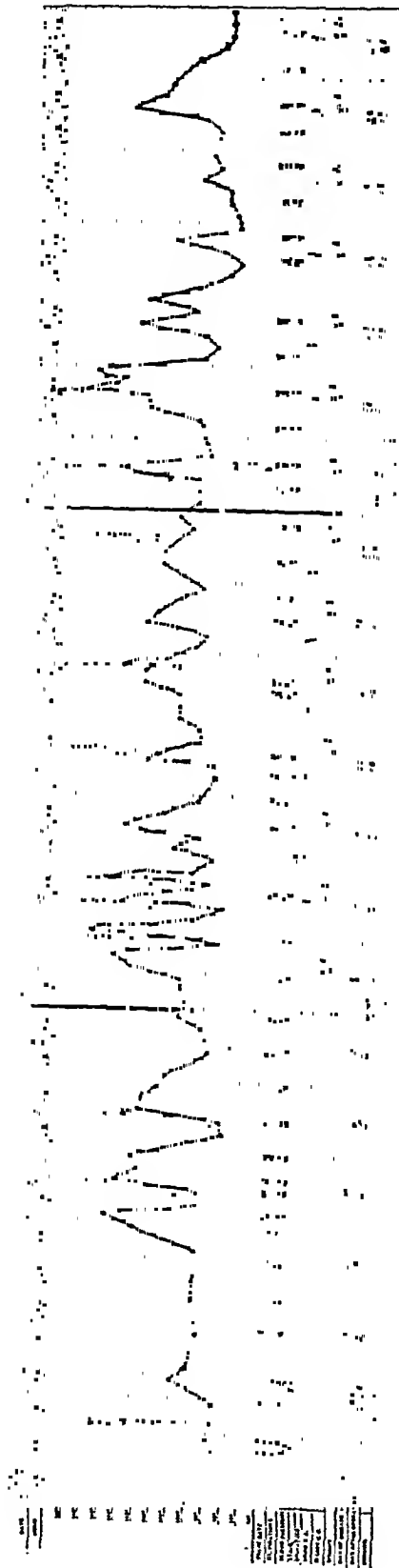


Fig. 1.—Temperature Chart.

noon the pain in the toes of the right foot became excruciating and discoloration of the toes and plantar surface, first blue, then green and later black also appeared. During the night, the fingers of both hands to the second phalangeal joint became cyanotic, and painful, but the general condition of the patient however appeared fair.

By the fourteenth of July 45 c.c. of gynergen had been administered subcutaneously. The radial pulse was still absent, the numbness in the fingers persisted, the toes were stiff and discolored, the patient drowsy and dull mentally.

Competent surgical consultants offered in explanation of the symptoms in the right foot and the vascular disturbance in the left the diagnosis of saddle thrombus of the common iliac. They advised immediate surgery to check the advancing process.

Before the operation the idea was suggested, that the condition might be due to an ergot idiosyncrasy and ergot gangrene. With the object of ruling this possibility out before the intended operation all medications including gynergen were discontinued.

Twenty-four hours after cessation of ergot therapy there occurred a remarkable change; the upper extremities became warmer, the numbness and tingling of the

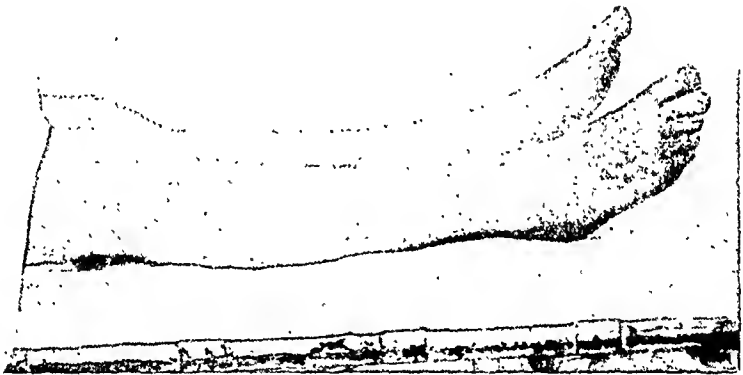


Fig. 2.—Showing line of demarcation in gangrene of both feet, the right more extensive than the left.

fingers less marked and *the radial pulse returned*, and of good quality. Soon the patient experienced better sensation in the left foot with less discoloration of the heel. The general condition of the patient was much improved. The pain in the right foot, however, continued severe, the process had apparently already progressed too far for it to recede.

On the following day, improvement in the right foot also became evident. There was better sensation from the heel to the ball of the foot, but from here to the toes there remained complete insensibility with blisters forming on the sole which later became a discharging sinus. The left foot had by this time completely recovered sensation and color. The radial pulse was of excellent quality. The patient was quite alert mentally.

On the nineteenth, the discoloration and demarcation on the right foot affected the distal half; complete gangrene of the deeper parts had not yet set in. It was thought that collateral circulation with local improvement might yet be established, for the sole had changed from black to a red mottling, pointing to a possible return of circulation. The left foot and upper extremities were by now entirely normal.

Local therapy and baking were employed and improved the condition con-

siderably; the only parts which were apparently definitely lost were the distal phalanges of the first three toes which subsequently did go through a process of spontaneous amputation.

On September 18 the patient requested to be discharged, her toes were still in the state mentioned; the base of the fourth and fifth toes was practically healed; the other parts showed exposed bone. A sinus at the sole of the foot was discharging. The patient was advised to return to the clinic for continued treatment.



Fig. 3.—Showing result two years later, with loss of all toes in right foot by spontaneous amputation and complete recovery in left foot.



Fig. 4.—Side view of right foot.

About a month later, on October 26 the patient was readmitted to the hospital. There was still the sinus at the ball of the foot and exposed bone was in evidence. The negative showed the missing terminal phalax of the right great toe, the whole of the adjacent toe and the two terminal phalanges of the middle. All bones of the foot showed atrophy; the bone at the base of the fourth toe appeared somewhat rarified as was also the base of the small toe and the articular surface of the cuboid.

The patient was operated upon November 11 for the purpose of removing the stumps of the first, third and fourth toes, which were disarticulated at their metatarsal union. The sinus on the plantar surface was probed and found to

extend to the second and third metatarsal. A dorsal incision was therefore made to expose the third metatarsal which was found denuded and containing a small abscess. This metatarsal was also removed, the wound then packed with iodoform gauze. The patient made an uneventful recovery and left the hospital on December 10, but with the wound still in the process of healing.

The differential diagnosis between ergotismus gangrenosus and puerperal gangrene following blocking by a thrombus is not always an easy task. The case of puerperal gangrene described by Wormser illustrates this difficulty even to as keen an observer as Wormser. His case was as follows:

Healthy woman, para ii. First complains of pain in the calf of left leg six days after normal delivery. The saphenous vein was painful and hard; temperature 38.5 R, pulse 124. During the subsequent three days the condition remained unchanged. On the twelfth day of the puerperium, the foot became involved, the pain in the leg more severe with slight edema appearing. The following day the limb assumed a pale livid color and the toes and adjoining tissues became insensible. Gradually the whole foot became dark blue to black and this extended to beyond the ankle. On the thirty-ninth day of postpartum Bier's amputation of the leg was performed, the postmortem showing almost complete gangrene of the foot to the very malleoli. The cellular tissue was edematous, the musculature of grey brown color. The tibialis posticus contained no thrombi, but the arteria pedica had a solid, adherent thrombus. All the large veins were blocked with thrombi.

In our study of the toxicity of gynergen, a letter was forwarded to the manufacturers of the drug inquiring as to their experience regarding the toxicity of gynergen, and it brought the following reply, which might be of interest.

"It is of course a well-known pharmacologic fact that ergot may produce gangrene, but the therapeutic doses of gynergen and of fluid extract of ergot, U.S.P., are so far removed from the gangrene producing doses, that, contrary to what I believed before this review was made, it is very unlikely that ergot had anything to do with the etiology of the case in point. Gynergen, for instance, has been administered in doses exceeding 6 mg. (six tablets) per day for weeks and even months without untoward effects. Gynergen has literally been administered in millions of cases (especially in Europe) in doses of three to six tablets per day, yet I have not heard of any cases of ergotismus gangrenosus, although many patients must have had a similar constitution to that of the patient at the Brownsville Hospital. If ergot was actually the cause of the gangrene in your case, we would undoubtedly have had other similar reports."

However, a perusal of European literature on gynergen brought forward among others a report by Herbert Panter, entitled "*Tabetic Symptoms after Gynergen Injections*" (Med. Klin. 22: 880, 1926), which may be summarized as follows:

Two days before the removal of a right-sided goiter and the day following the operation, his patient received three ampules of gynergen daily. During the last afternoon, the patient suddenly felt noises in the ears, lost her pupillary reflexes with failure also of patellar and tendon reflexes. Since her Wassermann reaction was negative and no other grounds were available to explain the phenomena, these had

to be attributed to the gynergen therapy. When the gynergen was discontinued, the pupillary and patellar reflexes returned, and a week later normal conditions were completely restored. Panter concluded, that gynergen must have a peculiar selective action on the central nervous system.

COMMENT

A careful study of events in our case in their sequence must lead one to the conclusion that we are dealing here with an undoubted case of ergotamine poisoning; the prompt return to normal of affected parts after cessation of the administration of the offending agent must convert even the skeptical.

Leading authorities in toxicology state that ergot when given in therapeutic doses has no effect upon the organism except when in pregnant state, where it often induces uterine contraction with expulsion of contents. Usually, acute ergot poisoning is rare, but in cases where it is taken with the intent to induce abortion, the symptoms generally comprise collapse, weak, rapid pulse, tingling, itching and coldness of the skin, vomiting, diarrhea, confusion of mind and unconsciousness and, in addition, local symptoms, hemorrhage from the uterus and abortion. Eechymosis in the subcutaneous tissues and internal organs was also observed. Occasionally after repeated small doses gangrene supervenes in such areas as the toe nails.

Chronic ergot poisoning was not uncommon some years ago; as a matter of fact, from time to time fairly widespread epidemics occurred as the result of the ingestion of bread containing ergot, especially after poor harvests and in wet seasons. Numerous instances of ergot gangrene epidemics are reported where the sufferers made pilgrimages from Europe to the Holy Land for a cure. There they received beside "religious blessings," also ergot-free bread, which enabled them to return home cured. The frequent occurrence of chronic ergot poisoning has enabled fairly accurate study of its symptomology. Symptomatically, ergotism is divided into two fairly distinct and sharply defined groups, one with nervous manifestations and another with gangrene. At times both these forms are combined, but most usual there is a prevalence of the gangrenous type, the local gangrene is preceded by coldness, discoloration, and numbness, to be finally followed by complete blackness and anesthesia of the parts involved. The gangrene often affects the limbs, but especially the fingers and toes. Sometimes a gangrenous organ will drop off with little or no hemorrhage. Gangrene of the internal organs also occurs and shows itself in cataract of the eye, ulcers in the bowel, stomach, lung or uterus. Abortion is rarely observed in the course of chronic ergot poisoning, and pregnancy seems to run its ordinary course in many cases.

In the nervous form, the first symptoms are depression, weakness, and drowsiness, then headache and giddiness, painful cramps in the limbs and fornication. In severe cases paroxysmal convulsions set in,

generally tonic but often epileptiform, leaving as sequelae contractures, etc. Some mental weakness, rarely amounting to real dementia, often follows recovery from ergot poisoning. It is generally conceded that the gangrenous type is the more characteristic and the more frequent of the two.

The action of ergot or ergotoxine upon the living organism resembles that of adrenalin, in so far, as like it, it acts on the myoneural junction of the sympathetic nerve. But while adrenalin stimulates the junctions, whether motor or inhibitory, ergotoxine does not affect the inhibitory but only the motor; and whereas it stimulates these in small doses, it depresses them in larger: It is also less powerful than adrenalin, though longer lasting. Ergotoxin, unlike adrenalin, taken over long periods, is capable of producing gangrene in distal parts of the body, the toes, fingers and nose, the gangrene presumably being due to prolonged constriction of arterioles, shutting off the blood supply to the parts affected. In larger vessels it causes occlusion of the lumen by hyaline thrombi produced by its toxic effect upon the vascular endothelium.

CONCLUSIONS

While ergotismus gangrenosus is of rather rare occurrence, occasionally such cases do occur, and should be kept in mind.

Where ergot in any form must be prescribed over a long period of time, symptoms of its toxicity should be thought of early.

Like many other drugs, patients may have an idiosyncrasy to ergot, and the complaining of the early symptoms of poisoning should not be ignored.

The differential diagnosis between ergotismus gangrenosus and puerperal gangrene is very difficult. The therapeutic test is practically the only means that can be employed to make the diagnosis.

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A PROPERITONEAL CYST (PROBABLY OF TRAUMATIC ORIGIN) ASSOCIATED WITH A FIBROMA OF THE OVARY

BY KARL H. MARTZLOFF, M.D., PORTLAND, OREGON

(From the Department of Surgery and Surgical Pathology of the University of Oregon Medical School)

THIS case should be of interest for several reasons: (1) the composite pathologic picture which it presents is very rare; (2) the ovarian fibroma occupied an unusual situation; and (3) the accumulation of properitoneal fluid was probably the result of traumatism caused by the use of a motorized vibratory device of a recently popularized design and intended to do away with superfluous fat.

CASE REPORT

F. M., a white woman, twenty-six years of age, was first seen by me June 11, 1928.

The family history was entirely irrelevant. The past history also was negative except for a successful appendectomy with drainage, performed when the patient was eight years of age and after which she had had no further abdominal symptoms.

The complaint for which the patient was originally seen began at the time of her marriage, about fourteen weeks before, when sexual intercourse was found to be so painful as to be practically prohibitive. The general physical examination was essentially negative except for a true vaginismus. Combined pelvic examination and treatment were instituted (June 23, 1928) under general anesthesia (N₂O + O); at this time the uterus and its adnexa presented essentially normal palpatory outlines.

Recovery was uneventful, and the patient was without further complaint until October 19, 1928, when, following the use of a "health motor" for abdominal massage, she began to have some lower abdominal discomfort. The pain was rather general across the abdomen below the level of the umbilicus and was of a dull aching character. There was no radiation of the discomfort and she gave no history of gastrointestinal or urinary symptoms.

Physical Examination.—Pulse, temperature and respiration normal. Abdominal examination revealed a right rectus sear without hernia formation but with a definite asymmetry rendering the right side of the abdomen more rounded than the left. In fact the left half of the abdomen appeared flattened both at rest and during forced respiration. On palpation there was definite tenderness and rigidity, most marked just below the level of the umbilicus, in the left midclavicular line. This extended out to the left anterior axillary line, beyond which no tenderness or rigidity was elicited. The tenderness was no less pronounced when the muscles were tensed than when they were relaxed. There was no tenderness in the left hypochondrium, in the left suprainguinal region, or immediately above the pubes. No ecchymoses were visible. There was no muscle spasm or cutaneous hyperesthesia, and the presence of percussion discomfort was not ascertained.

On October 24, 1928, the symptoms were still persisting, and in addition there was complaint of some dysuria and frequency, but no discomfort after micturi-

tion and no sense of incomplete emptying of the bladder. The temperature was 99.2° F. Leucocytes 6,750 with a normal differential formula. The results of abdominal examination were the same as on October 19, and on this day percussion caused no discomfort and revealed no abnormal areas of dullness. On pelvic examination the uterus was found to be in anterior position forming an acute angle with the cervix. The parametria were apparently clear. A catheterized specimen of urine was normal on microscopic and bacteriologic examination.

On November 7, 1928, the symptoms were the same, but at this time a symmetrical area of percussion dullness was made out, extending from the pubes to

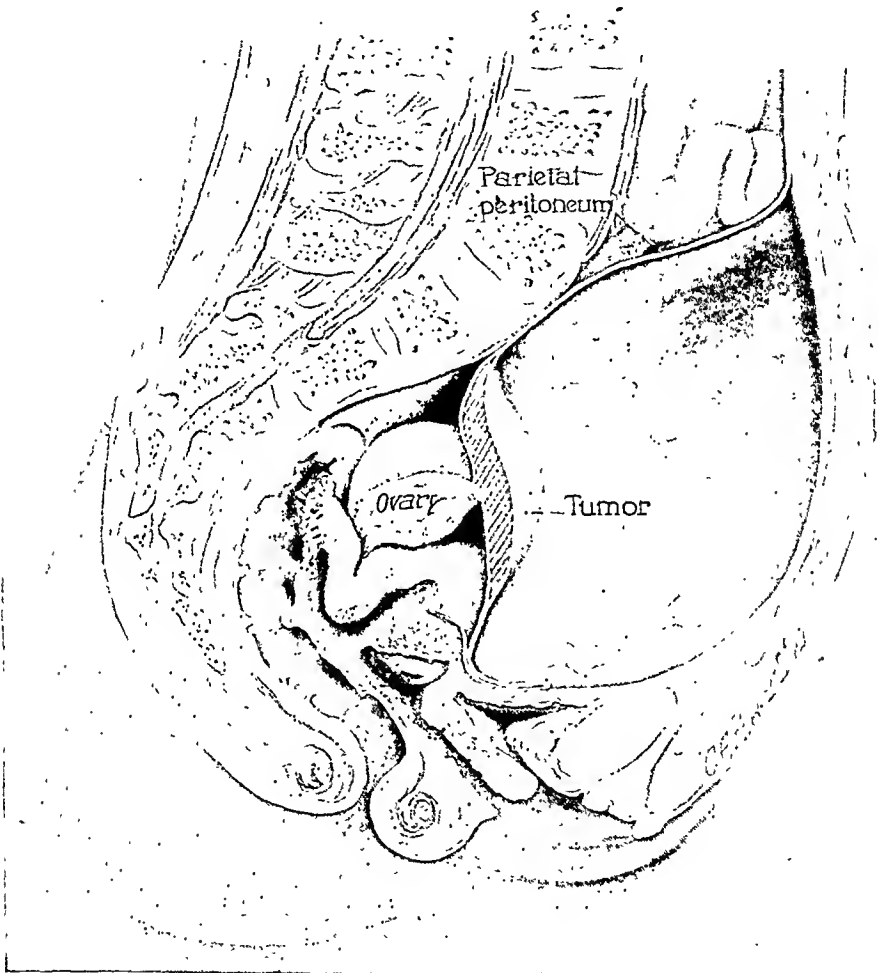


Fig. 1.—Schematic drawing in sagittal section to the right of the midline of the condition found at operation. The drawing is inaccurate in that the ovarian attachment to the tumor should be near the superior margin of the latter and the superior margin of reflection of the parietal peritoneum should be slightly below the level of the umbilicus.

the umbilicus. The superior margin of this dull zone had a regularly convex contour which persisted after catheterization of the bladder. On pelvic examination the uterus was found in third degree retroversion, and a large fluctuant elastic mass extending to the umbilical level was outlined in front to the right of the uterus.

A diagnosis was made of "ovarian cyst, possibly a dermoid."

Operation.—November 16, 1928. A midline infraumbilical incision was made, and large tortuous veins were encountered in the properitoneal tissues. These were cut between presection ligatures of No. 00 plain catgut, and it was my impression that we were approaching an ovarian cyst with an established collateral circulation through adhesions to the parietal peritoneum. Since the cyst could not be separated from the parietal peritoneum, a small incision was made through its wall. This was followed by a gush of reddish fluid, and on aspiration slightly more than 2.5 liters were withdrawn. A wider incision then disclosed a cyst cavity, the anterior wall of which was formed by the anterior abdominal wall but lacking its peritoneal covering. The remainder of the cyst wall was composed of reflected anterior parietal peritoneum as shown in Fig. 1. This peritoneal reflection extended from within a few centimeters from the umbilicus to the space of Retzius and from about the anterior axillary line on the left to a point midway between the midclavicular and anterior axillary lines, on the right. This latter limitation was due to dense adhesions about the site of the previous appendix operation.

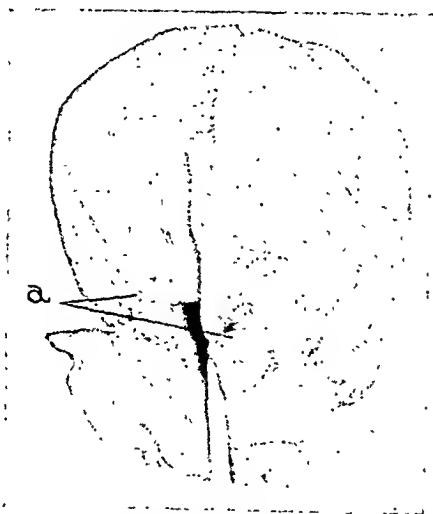


Fig. 2.—Photograph of posterior aspect of the tumor. At *a* is seen the site of its former attachment to the right ovary.

The cyst was smooth walled, and on its posterior wall in the midline was seen a glistening grayish-yellow area, measuring between 7 and 8 cm. in its greatest dimension. On palpation this was diagnosed as a tumor mass.

At the superior angle of the incision a small opening was made through the parietal peritoneum into the peritoneal cavity. Through this the reflected peritoneum could be displaced anteriorly and inferiorly, and the uterus was found to be in the third degree retroposition with essentially normal adnexa except for the right ovary which was attached, near its superior pole, by a broad stout pedicle to the posterior upper aspect of the tumor mass previously noted.

The pedicle was cut and the tumor mass was removed from between the peritoneal layers. The peritoneum was readily separated except in the midline anteriorly, where it was firmly adherent and had to be removed with the mass. This left a defect several centimeters in area which was readily closed with an everting suture of No. 00 plain catgut leaving a smooth surface on the serosal aspect.

Several hematomata were found in the substance of the peritoneum where it formed the superior wall of the cyst. These were opened and evacuated. Careful inspection failed to reveal any bleeding points either on the denuded posterior aspect of the anterior abdominal wall or on the reflected peritoneum. The peritoneal

incision was closed and at the same time was sutured to the abdominal wall in the midline in order to facilitate obliteration of any dead space, and the usual abdominal wound closure was performed without drainage. Convalescence was uneventful except for some serosanguineous drainage from the inferior angle of the incision. This began ten days after the operation and persisted for forty-nine days. At the present time, one year after her operation, the patient feels entirely well.

Pathologic Examination.—The gross specimen consists of a tumor mass measuring $7.5 \times 6.5 \times 2.5$ cm. (Fig. 2). It is pale gray in color and rather soft in consistency. On section, the surfaces present a smooth, gray, translucent, homogeneous appearance, and scraping with the knife point meets with but little resistance because of fibrous stroma.



Fig. 3.—Photomicrograph showing the histologic characteristics of the tumor.

Sections for microscopic examination were made of formalin-fixed material and stained with hematoxylin and eosin. Sections taken through the area of attachment of the tumor to the ovary show that the tumor structure extends right up to the point of its operative amputation. The tumor is very cellular, being composed of spindle-shaped cells arranged in orderly whorls and wave-like strands with considerable intervening eosin-staining cytoplasm (Fig. 3). The nuclei are regular in size, shape and staining reaction, and no mitoses are seen. Other areas show some evidence of degeneration. The blood vessels are about normal. The surface of the tumor is represented by fibrocellular membrane which does not have the appearance of a true capsule. No ova or ovarian follicles are seen.

The tumor was considered to be a cellular fibroma without evidence of malignancy.

Dr. Frank Menne of our department of pathology and Dr. E. W. Goodpasture of the department of pathology of Vanderbilt University Medical School found the histologic structure of the tumor characteristic of ovarian stroma.

COMMENT

The case reported represents, we believe, a probable instance of injury to the abdominal wall followed by a properitoneal accumulation of blood-tinged fluid. The causative factor was probably a motorized device of popular pattern designed to give vibratory massage. This is accomplished by means of a belt-like strap which half encircles the trunk or limb, while each of the two ends is attached to an eccentrically situated knob, one on either side of an electric motor. When set in motion the motor causes a distinct jarring or vibratory sensation which is transmitted to the body by means of the tautly held half-encircling strap.

From the results in this case, it would appear that such motorized vibratory devices are certainly not entirely harmless when employed even by apparently healthy individuals.

The possibility of this cyst arising from an urachal cyst was considered, but nothing suggesting a urachus was seen at operation. Also no epithelial structures were noted in the microscopic sections from the surface of the tumor.

The fibroma lying in the layers of the anterior parietal peritoneum is probably merely a coincidental matter in so far as the properitoneal cyst is concerned. Most likely this tumor was present at the time of the pelvic examination under gas anesthesia but was not detected.

The occurrence of a midline fibroma as a neoplasm arising from the urachus would be, we believe, of particular rarity. However, the ovarian attachment of the tumor together with its histologic continuity makes it most probable that it was of ovarian origin. Its location in the peritoneal layers of the anterior abdominal wall is, we believe, altogether unusual, nor have we been able to find a counterpart in the available literature.

808 MEDICAL DENTAL BUILDING.

RUPTURED UTERUS WITH LIVING MOTHER AND BABY TWO CASE REPORTS

BY CARL R. STEINKE, M.D., F.A.C.S., AKRON, OHIO

RUPTURE of the uterus following previous cesarean section is a sequel well worthy of recording in order that methods may be devised to avoid the catastrophe. Most observers agree that faulty healing in the uterine incision is the principal etiologic factor. This may be due to inclusion of decidua tissue, faulty suturing, or infection of the uterine incision. Several cases have shown a tearing of the uterine wall some centimeters to one side of the suture line through the myometrium. The implantation of the placenta may play a part, but this has not been determined. The rupture may take place any time after the beginning of the seventh month, without previous labor pains or other means of warning.

The mortality is estimated from the reported cases to be 50 per cent for the mothers and 90 per cent for the infants, and with this fact in mind I felt the following cases should be recorded.

CASE 1.—Mrs. O. W. P., white, thirty-one years of age, had one normal birth nine and one-half years previously, followed in one and one-half years by curettage, trachelorrhaphy and appendectomy. Three years after this operation cesarean section for placenta previa was performed elsewhere; therefore, no facts are available as to the method of suturing the uterus. She said there was fever for several days following the operation.

On January 31, 1926, she was sent to the City Hospital in labor at full term. The pains were normal for a time when suddenly she developed inertia. Dr. C. N. Long, who was attending her, made a diagnosis of ruptured uterus and ordered preparation for operation, which took place as soon as possible.

Upon opening the peritoneum I found the fundus torn its full length and everted down to the cervix. The placenta was attached on the posterior portion of the uterine cavity, while the baby lay free in the abdomen. There was very little hemorrhage. A complete hysterectomy, including both tubes and left ovary, was performed (Figs. 1 and 2). The mother made a good recovery, and the baby is now a healthy girl of four years.

Pathologic report by Dr. T. H. Boughton: A large uterus showing a long ventricular slit in the fundus. The upper part of the uterus is completely everted, and a large normal-looking placenta covers the outer portion of the everted uterine mass. The cervix is dilated sufficiently to admit one finger and is not everted. The tubes are about normal in appearance. Diagnosis: Pregnant uterus with a long slit in the fundus and complete eversion of the upper portion. No decidua tissue was found in the uterine scar.

CASE 2.—Mrs. F. K., white, thirty-eight years of age, had a cholecystotomy in February, 1923, followed by a cholecystectomy two months later. There were nine living and two dead children, with two miscarriages before this pregnancy. Her health was always fairly good during pregnancy except for some nausea and vomiting and slight edema of the hands and feet.

On June 28, 1924, there had been a cesarean section performed elsewhere, revealing a partially detached placenta, a portion of which extended over the cervical canal. The operation was done through a median incision with an opening made on the anterior portion of the fundus. The uterus was closed in three layers with single chromic catgut. The abdomen was closed in layers with catgut and silk-worm gut. The baby weighed 4 pounds 10½ ounces. There was considerable fever following, the temperature going as high as 104.8° F. the following day and 101.4° the succeeding day. The temperature gradually came down to normal by July 13. The lochia was reported as offensive on the third day.

The abdominal incision healed following some infection, but later developed a postoperative hernia. The urine was normal during her stay in the hospital, and the highest white blood count was 17,600. She had one normal delivery about two and one-half years after the cesarean.

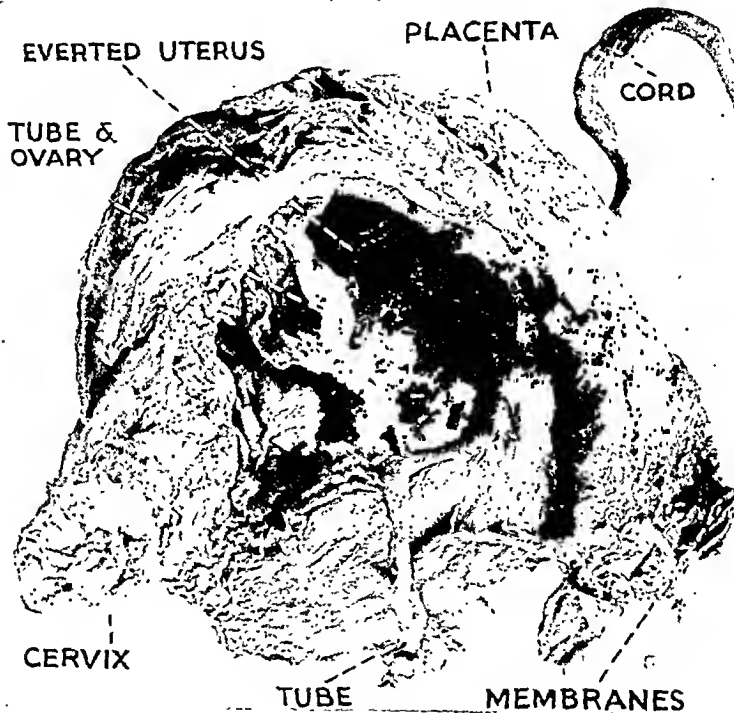


Fig. 1.—Case 1.

Her last menstruation began June 4, 1927, and she went into labor March 18, 1928. There were several severe pains followed by shock and cessation of the pains. The baby could be felt high in the abdomen, so Dr. S. Greenfield, who was attending the patient, diagnosed a ruptured uterus, and sent her to the People's Hospital for immediate operation. The urine showed a faint trace of albumin but was otherwise negative. The white blood count was 18,300 and the hemoglobin 60 per cent. I opened the abdomen and found a 9 pound 5 ounce baby lying free in the abdominal cavity. The baby and placenta were removed. The scar in the uterus from the previous cesarean section had split wide open with the placenta attached on the posterior uterine wall. There was very little free blood present. The omentum was adherent in the upper abdomen at the site of the previous gall bladder operations. The abdominal wall was very thin and stretched, the result of the previous pregnancies and the ventral hernia. Supracervical hysterectomy with both tubes and ovaries was performed, and a strip of the lower abdominal wall 5

inches wide resected, suturing the fascial planes and muscles with chromic catgut. Figure-of-eight tension sutures of silkworm were then inserted, and the skin was closed with dermal suture. A piece of rubber tissue was inserted under the skin for drainage.

The second day the rectal temperature rose to 101.6° F. but gradually returned to normal by March 23, followed by a good recovery. The mother is well, but the baby died of measles two years later.

Pathologic report by Dr. F. C. Potter: The placenta measures 18 cm. in diameter by 2 cm. in thickness. The attached cord measures 60 cm. in length and 1 cm. in diameter. The borders are thin. It contains many gray sclerotic patches. The uterus (supracervical) measures 15 × 14 cm. One surface (probably the

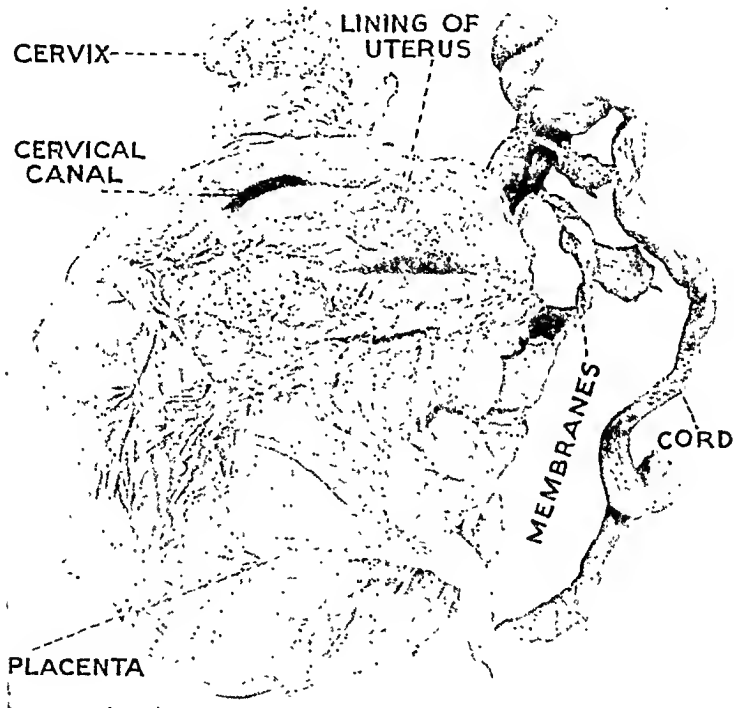


Fig. 2.—Case 1.

anterior) contains an irregular, torn opening measuring 7 × 4 cm. The borders of the torn area are ragged and thin. On section the borders have the appearance of an old scar. The cavity is large. The left tube measures 14 × 3 cm. The fimbria is patent. On section the wall is a little thickened. The lumen is small. The left ovary measures 4.5 × 2.5 cm. The right tube measures 10 × 0.6 cm. One cyst is attached along the border. It resembles its fellow. The right ovary measures 3.5 × 2 cm. It contains numerous sacs filled with clear fluid and gray corpora lutei. Accompanying this specimen are two irregular masses of skin and subcutaneous fat, measuring about 15 × 5 cm. each. Microscopic: Ovary: The outer border is made up of fibrotic ovarian tissue within which is a ring-like mass of degenerating corpus luteum whose inner wall is made up of a rather broad band of compact connective tissue. Uterus: These sections are made up of two loosely arranged masses of uterine muscle, both of which show moderate interstitial fibrosis.

Between the two masses of muscle there is a broad band of pale fibrous tissue with very few nuclei. One surface is partly covered with organizing blood clot. Placenta: Sections show marked fibrotic changes, with only remnants of placental tissue. There is no evidence of chorionomatous changes. *Diagnosis:* Ruptured uterus. Sclerosis of placenta. Corpus luteum of pregnancy.

SECOND NATIONAL BUILDING.

FETAL DYSTOCIA DUE TO METASTATIC NEUROBLASTOMA OF THE LIVER*

BY HENRY T. HAGSTROM, M.D., BROOKLYN, N. Y.
(*First Obstetrical Service Methodist Episcopal Hospital*)

THIS case is presented as an instance of dystocia due to an hypertrophied liver in the fetus, as a result of a metastatic newgrowth from a congenital tumor of the suprarenal gland. Difficult labor because of a greatly enlarged fetal liver is so rare that a report seems justified. After a fairly extensive review of the literature I have been unable to find any record of a similar case.

CASE REPORT

Mrs. D. S., aged thirty-nine, gravida viii, para vii, was seen in consultation at home about 4 A.M., February 13, because of failure to make progress after twenty-four hours of labor. This pregnancy had been normal throughout, and pelvic measurements were ample. The patient's general condition appeared good, though she was tired. Pains were coming every three to four minutes.

An examination of the abdomen revealed an apparently large baby, lying obliquely from right to left, with a hard, round, ballotable mass corresponding to fetal head, occupying the fundus of the uterus. Another more fixed mass filled the left side of the pelvis. The baby's back was toward the left.

An examination by rectum revealed a roomy pelvis, with the cervix nearly effaced and three fingers' dilated. The membranes were intact. The fetus lay in a transverse position with a foot apparently presenting. In addition there was an obstructing tumor at about the level of the superior strait.

Because of the unusual complication present, it was decided to transfer the patient to a hospital. Accordingly she was given $\frac{1}{4}$ gr. of morphine sulphate to secure rest, and transported by ambulance to the Methodist Episcopal Hospital.

After admission labor pains diminished in frequency and intensity for two and a half hours, then active labor ensued, with pains every three minutes. At 9 A.M. when the cervix was about fully dilated and well effaced, the patient was taken to the delivery room to determine the exact presentation and the nature of the mass obstructing the inlet. The membranes were then ruptured. A left footling presentation was confirmed. Upon further investigation the right foot was easily felt and brought down alongside the presenting left foot. With moderate traction and uterine contractions the presenting parts could not be delivered beyond the mid-portion of the baby's thighs. Further efforts in extracting the breech were futile because of some obstruction evidently associated with the body of the child.

*Read before the Brooklyn Gynecological Society, December 6, 1920.

On passing the examining fingers up over the baby's abdomen a hard, dome-shaped swelling could be made out, wedged in the pelvic inlet. Externally it could be felt above the symphysis. As it was quite certain that the dystocia was due to a large abdominal tumor and that delivery without evisceration was impossible, the baby's abdomen was incised with a pair of scissors. On exploration there was revealed a hard, nodular mass almost filling the abdominal cavity. Portions of the tumor were removed until it was reduced sufficiently in size to permit completion of the breech delivery without difficulty.



Fig. 1.—Photomicrograph, low power, of section of suprarenal gland showing capsule, and cortex being invaded by medullary tumor cells.

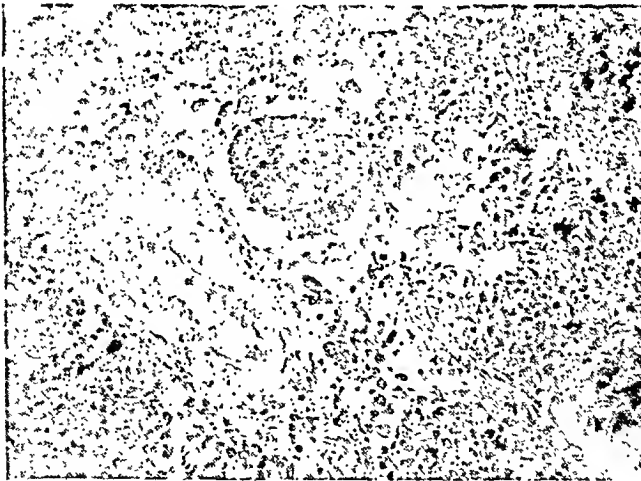


Fig. 2.—Photomicrograph of section of suprarenal gland, showing invasion of lymph vessel by tumor cells.

The pathologic report by Dr. Esmund Smith is essentially as follows:

Thorax.—The chest is barrel shaped with an increased anteroposterior diameter due to pressure of a tumor in the upper abdomen. The heart, thymus and lungs are normal.

Abdomen.—The abdomen is markedly distended by a mass in the upper abdomen. There is a long, ragged, transverse incision in the lower abdomen. Through the incision protrudes a part of the tumor, which is seen to be the liver. Practically

the entire abdomen is filled and distended by the greatly enlarged liver. Upon removal it is found to weigh 700 gm. and measures 14 by 12 by 6 cm. Several fragments were torn off during the evisceration. The capsule of the liver is not thickened. The surface is slightly nodular. Most of the normal brown surface is replaced by irregular white areas and nodules. On section the liver is moderately firm and the cut surface presents an appearance somewhat like granite. It is composed chiefly of irregularly shaped white areas varying from 1 to 2 mm. to 1 cm. in diameter, separated by areas of brownish-greenish liver tissue. Grossly, this looks like a liver riddled with metastatic growths. Stomach and intestines are compressed into a small mass in the rear of the abdomen, and the intestines are only a few millimeters in diameter. The right kidney is normal. The right adrenal is missing. In its place is a round tumor measuring 6 by 6 by 5 cm. It is attached to the upper pole of the kidney by a short, fibrous pedicle. The tumor is encapsulated, solid, dark red and on section is homogeneous, without visible structural details and looks somewhat like a blood clot.

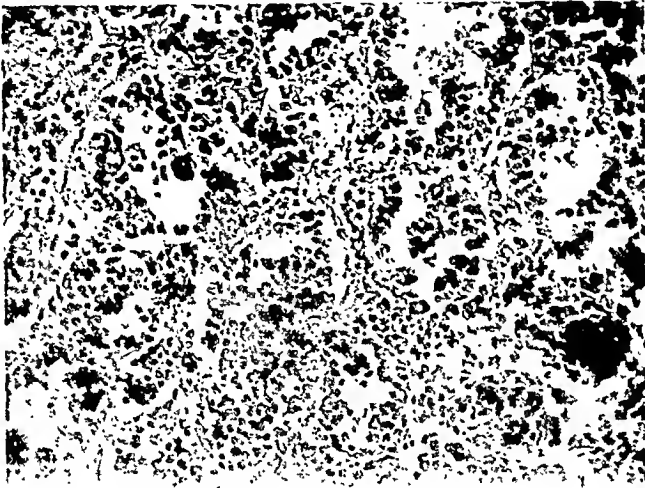


Fig. 3.—Photomicrograph of section of metastasis to liver showing pseudorosettes.

Microscopic.—Adrenal: Practically the entire gland has been destroyed by a newgrowth. Portions of the capsule and cortex are found in spots. The tumor consists of round cells slightly larger than lymphocytes. They are arranged in small groups, sometimes in the form of pseudorosettes. Under high power they are seen to consist of round or oval nuclei with an eccentric nucleolus and chromatin network. Only a few cells show traces of cytoplasm. There is marked extravasation of blood.

Liver: Much of the liver tissue has been replaced by a newgrowth composed of cells similar to those in the adrenal tumor, with the same grouping of the cells. There are many extravasated red blood cells.

Diagnosis.—Congenital sympathicoblastoma of the right adrenal, Pepper type.

According to Ewing, these cases fall clinically into the two groups of adrenal neurocytoma known as the Pepper and Hutchinson types.

In the Pepper type, as illustrated by the case herewith presented, the tumor is usually in the right adrenal with extensive metastasis in the liver. In the Hutchinson type the tumor is more frequently in the

left adrenal and there are metastases to other organs, but particularly the ribs and cranium. Histologically they have the structure of embryonal neuroepithelium. Since most of the tumor cells are of the non-differentiated nerve cell type it is by some authorities classed as a sympathicoblastoma.

The case here reported shows a primary tumor of the right suprarenal gland with metastasis to the liver, which was so enlarged as to preclude normal delivery.

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52 EIGHTH AVENUE.

INCARCERATED RETROVERSION ASSOCIATED WITH PREGNANCY*

BY ADOLPH JACOBY, M.D., F.A.C.S., NEW YORK, N. Y.

(Assistant Professor of Gynecology, New York Post-Graduate Medical School and Hospital)

THE patient was thirty-four years old, married two years and had never been pregnant. She began to menstruate at the age of twelve years; her menstrual periods were regular every twenty-eight days, lasting three days, moderate in amount. Last period September 19, 1927.

On November 1, she began to feel nauseated and vomited occasionally. This continued until the middle of November. After that she felt well until the first of January. The patient then noticed that the abdomen was beginning to swell, and at the same time she felt distressed and was unable to void, although she had the desire to do so. Shortly thereafter she voided a small amount with much pain, but with no straining. The patient took some spirits of niter and hot douches and felt better for a short time. The symptoms returned. She then consulted a doctor who prescribed urotropin, which for some unknown reason improved the condition for a few days, and then the difficulty in voiding and pain returned.

Three weeks later the swelling increased. She then consulted one of the city clinics, where she was given some tablets and advised to have an x-ray taken to determine whether she had an ovarian cyst or was pregnant. The first x-ray showed a mass, no fetal parts. A uterosalpingogram was then attempted but could not be done as the uterus could not be injected.

On January 19, the patient applied for treatment in the Gynecological Department of the New York Post-Graduate Hospital. Her chief complaint at that time was distention of the abdomen, sharp pain all through the lower abdomen, and difficulty in voiding. She could void without pain or difficulty on lying down. She had no backache, no constipation or discharge and no pressure sensation in the

*From the Department of Gynecology, New York Post-Graduate Medical School and Hospital.

Read at the New York Academy of Medicine, Section of Gynecology and Obstetrics, April 23, 1929.

back. The patient had to walk doubled over. Up to the time of appearing at our clinic, the patient had never been catheterized.

The patient stated that she had voided five minutes before getting on the table for examination. On examination the first thing noted was the swelling of the abdomen reaching about one inch above the umbilicus. The peculiarity of the swelling was the abrupt rise of the convexity from the superior border of the symphysis. A short metal self-retaining catheter was introduced and about 500 c.c. of urine was withdrawn. No very appreciable change in the swelling was evident. Not feeling satisfied with the result of this catheterization, the metal catheter was withdrawn. A soft rubber catheter was introduced and about 1500 c.c. more of urine was obtained. The swelling then largely subsided.

On vaginal examination, the first thing to meet the examining finger was a marked swelling just within the introitus on the posterior vaginal wall. On passing the protrusion and feeling for the cervix in the usual position, it could not be found. On deeper palpation, the cervix was found high up near the upper border of the symphysis, jammed hard against the under surface with the body of the uterus acutely retroflexed and in the hollow of the sacrum. The uterus was enlarged, soft and reached midway to the umbilicus and was evidently pregnant. An attempt was made to dislodge the uterus in the dorsal position but was not successful. The patient was then put in the knee-chest position and another attempt to dislodge the uterus manually was again unsuccessful. She was then admitted to the service of Dr. Walter T. Danureuther and subsequently operated upon.

The abdomen was opened in the midline, the upper limits of the incision extending to the left of the umbilicus. The peritoneum was opened just below the umbilicus. A very much thickened, hypertrophied bladder was presented immediately beneath the wound. The bladder had been carried high up in the abdominal cavity by the pre-existing distension. The examining hand was carefully insinuated under the fundus of the uterus: the top reached almost to the level of the umbilicus, and an incarcerated sacculation of the posterior wall filling the culdesae and true pelvis was discovered. This was not adherent but was dislodged with difficulty. The elasticity of the uterine wall then allowed a return to the normal outline, and the culdesae was no longer distended, exerting upward pressure on the cervix. The left tube and ovary were lifted up, examined, and seemed to be normal. The bladder displacement was then seen to be due partly to an underlying intraligamentous cyst in the right broad ligament, which contained a large number of greatly dilated veins. The cyst was brought up into the wound as far as possible, walled off with laparotomy pads, and the contents evacuated. (This step was taken because the pedicle could not be exposed, owing to the pregnant uterus occupying so much space in the pelvis.) The contents of the cyst were of clear, mucinous, watery material.

The head of the cecum was then seen to be adherent to the posterior surface of the cyst wall and was easily separated. The appendix was also involved in the inflammatory exudate and was removed in the usual manner: clamping, ligating the meso-appendix; ligating and amputating the appendix with inversion of stump. The cyst was then elamped as low down in the broad ligament as possible and ligated with No. 2 chromic double interlocking mattress sutures. The pelvis and right iliac fossa were wiped dry and seemed to be free from bleeding.

Peritoneum was closed with No. 2 plain catgut doubled; fascia with No. 2 chromic catgut single; skin with black silk reinforced with three silkworm gut sutures.

Pathologic examination of the tissues removed showed chronic appendicitis and parovarian cyst.

For five days after the operation it was necessary to catheterize the patient. The amount withdrawn was between 2 c.c. and 400 c.c. at each catheterization. On the fifth day the patient voided and continued to void thereafter without pain or discomfort.

She made an uneventful recovery and was up and about in eleven days. On February 24, 1928, she was examined. The fetal heart was heard midway between the umbilicus and pubis. The lower uterine segment was not flattened. The culdesac was free. Fetal movements and ballottement were easily determined.

On April 6, 1928, she was again examined. The cervix was back and pointed toward the hollow of the sacrum. There was no tension in the pelvis; the fetal head was palpable, and ballottement was easily elicited. The uterus reached midway to the ensiform cartilage. The patient was referred to New York Nursery and Child's Hospital for delivery.

On November 9, 1928, she again reported for examination. During that time she had given birth to a baby boy at New York Nursery and Child's Hospital. The delivery was entirely uneventful. The perineum was lacerated at the time of delivery and repaired immediately. The puerperium was normal. She was in the hospital for twelve days. She felt fine and had no bladder symptoms. The abdominal wall was firm. The perineum practically intact; the cervix was very slightly lacerated and pointed forward. The uterus was retroflexed, small, replaceable, but immediately dropped back into its original position. Evidently a congenital retroflexion.

SUMMARY

The points of interest brought out in this case are the following:

1. The importance and wisdom of preliminary catheterization before an initial pelvic examination.
2. The recognition of distention of the bladder and its differentiation from uterine enlargement by the abrupt convexity of the abdominal wall above the symphysis.
3. The reposition of the incarcerated pregnant uterus by operative procedure, without interference with the continuance of the pregnancy.
4. The resumption of normal bladder function.
5. The normal delivery of a healthy child at term.
6. The resumption of the retroverted position of the uterus after the birth of the child.

REPORT OF A CASE OF RUPTURED UTERUS FOLLOWING
ATTEMPTED VERSION, WITH COMPLETE RECOVERY
OF THE MOTHER AND A LIVING CHILD*

BY MORRIS F. GOLDBERGER, M.D., NEW YORK, N. Y.
(From the Obstetric Department of St. Mark's Hospital)

RUPTURE of the pregnant uterus following an attempted internal version is not so unusual an occurrence as to warrant special comment beyond the fact that it is one of the tragedies of obstetrics. It is a tragedy because of its results: occasionally the death of the child, frequently the death of the mother and if she survives, it is followed by an emergency operation which usually leaves her minus the uterus.

The case I am about to report had an outcome so different to the foregoing picture, as to be adequate reason for this publication.

Mrs. S., aged thirty-eight, para iv, began her labor on the morning of July 2, 1929. Membranes had ruptured with the onset of labor and at 10 A.M. she was said to be fully dilated. Her three previous children had been delivered spontaneously without complications. At 1:00 P.M. three hours after she was said to be fully dilated, her attending physician consulted with me over the telephone, citing the case and asking for advice because of the fact that she had not yet delivered. After inquiring into the history of the previous deliveries, I advised waiting. About 4:00 P.M. of the same afternoon, I was called to see her at her home. The patient was found to be a rather stout woman with a pendulous abdomen, having regular contractions that were not particularly severe, vertex presenting in the left occipitoanterior position, but the presenting part was not in the pelvis. She was advised hospitalization and was admitted on my service at St. Mark's Hospital shortly thereafter.

Since the cervix was completely effaced and the uterus did not appear to be tightly contracted or to have lost all its liquor amnii, it was thought best to attempt an internal podalic version and breech extraction. In view of her previous history of normal deliveries and the fact that she had been seven hours fully dilated with membranes ruptured and with the possibility of infection due to conditions in her home previous to admission to the hospital, cesarean section was thought to be contraindicated. Accordingly the patient was prepared for delivery, ether anesthesia was administered and internal podalic version was begun. The hand in the uterus found both feet quite readily and brought them to the vulva without much difficulty and then the first obstruction to the procedure arose. The head would not travel upward into the fundus of the uterus but remained just above the symphysis, the feet being at the vulva, the child was in a jackknife position. Traction on the feet was found of no avail, so an attempt was made to guide the head up into the uterus by gentle manipulation with the outside hand. With the right hand externally on the abdomen, the head was slowly and gently guided in an upward direction. There seemed to be some progress when suddenly a new oval mass presented itself just to the left of the uterus, but apparently branching from it just above the symphysis, palpable and visible through the abdominal wall.

*Read before the New York Academy of Medicine, Section of Obstetrics and Gynecology, October 22, 1929.

Diagnosis of rupture of the uterus with fetal head in the peritoneal cavity was made and confirmed when vaginal examination revealed an absence of head in the lower uterine segment. While the anesthesia was continued, the operating room was prepared and in about twenty-five minutes we were ready for laparotomy.

The abdomen was opened in the median line below the umbilicus, a small amount of free blood was found and the head was seen protruding from the anterior surface of the uterus, above the vesicouterine reflection of peritoneum and a little to the left side. After packing off the general cavity as much as possible, the uterine tear was enlarged and the child lifted out as in a low cesarean section. The child made some respiratory efforts and to our surprise was resuscitated without much difficulty. With the child out of the way, the amount of uterine damage could be definitely determined, and it was seen that the rupture had begun low down behind the bladder on the right side and then extended obliquely upward toward the left, dissecting the bladder away from the lower uterine segment, lifting the peritoneal reflection upward, and finally coming through into the general cavity on the anterior surface just above the bladder and to the left. The placenta was removed and the irregular rent in the uterus was closed with two layers of chromic catgut sutures and the peritoneal reflection of the bladder was used to cover over the suture line, in the manner employed in doing the low flap cesarean operation (overlapping). A small gauze packing was left in the uterus and a fair sized cigarette drain was used going down to the anterior surface of the uterus. The abdomen was closed around this cigarette drain in the usual manner. The patient was put to bed in the Fowler position and a hypodermoclysis of 700 c.c. of normal saline was given at once. Fluids by rectum were given for several days, consisting of retention enemas of 5 per cent glucose and 2 per cent sodium bicarbonate solutions, and Murphy drip of saline solution. Small doses of fluid were given by mouth after twenty-four hours and morphine sulphate grain $\frac{1}{6}$ hypodermically was given for the relief of pain. The postoperative convalescence was somewhat disturbing, the abdomen becoming markedly distended, but enemas and pituitrin hypodermically were followed by prompt relief. On the third day the patient developed a severe cough with considerable expectoration but her general condition improved constantly. For a week the temperature varied between 99° and 101.6° F. and then came down to normal and stayed down. The pulse ranged from 100 to 130 during this period but was always of good quality. The packing, which had been placed in the uterus at the time of operation, came down into the vagina and was removed from there on the evening of July 5, three days after operation. The cigarette drain was gradually removed and the wound healed by primary intention.

The mother was out of bed on July 16, fifteen days after delivery. The baby was a lusty female child that weighed 7 pounds 15 ounces at birth, and while it had a temperature for two days due to inanition, it was discharged with its mother on July 19, seventeen days after operation, weighing 8 pounds 11 ounces, both mother and child in good condition.

127 EAST EIGHTY-FIRST STREET.

DERMATITIS FOLLOWING PACKING WITH IODOFORM GAUZE*

BY N. B. SACKETT, M.D., NEW YORK, N. Y.

(From the Clinic of the Woman's Hospital)

IN THE literature of twenty or thirty years ago, when many granulating wounds, sinuses, and venereal ulcers were being treated with iodoform, we find many reports of iodoform poisoning.¹ Indeed Orfila² studied poisoning by iodine and its compounds in 1815, three years after the discovery of iodine by Courtois. Cutler³ collected 78 cases with a mortality of 34 per cent, and these reports bring out the frequency of symptoms referable to the gastrointestinal and central nervous systems, as well as the rarity of skin manifestations. Without taking up the researches of Bloch, Jadassohn, and Perutz⁴ on the causes of iodoform idiosyncrasy, we are struck by the paradox that while very large amounts have been given without intoxication, on the other hand poisoning even with fatal outcome has been observed after the smallest doses.² In recent years obstetricians and gynecologists have used gauze packing impregnated with iodoform in hundreds of cases; and yet reports of iodoform rash or any form of iodoform poisoning are rare. Among 2500 dermatologic cases in eight years Perutz found but one undoubted instance.⁴

CASE REPORT

Mrs. N. O. R., age thirty-eight, gravida ix, admitted to the Obstetrical Service of the Woman's Hospital on October 27, 1928. Her family history and personal history are irrelevant. Her past history includes: Three full-term pregnancies and five spontaneous abortions; and an operation in 1921 for plastic repair and retroversion, when marked general visceroptosis was noted. Influenza in 1918 is the only disease reported; and her blood Wassermann, vaginal and cervical smears have always been negative for syphilis and gonorrhea. Of special interest to this report is her statement that sixteen years before, "after taking quinine for a cold," she had an eruption confined to the face, lasting one week and similar to the rash to be recorded below, excepting that—to use her words—it was "more in ring forms."

This last, or ninth pregnancy presented mild toxemia symptoms, not alarming until date of admission when she entered *not* in labor, complaining of headache, obscure vision, swollen, painful ankles, and vomiting. Her blood pressure was 125/80, she received an enema and a colon irrigation; and after two hours went into labor which lasted four hours and thirty-five minutes. Light drop ether was used in the easy, spontaneous delivery of an 8½ pound baby. After delivery of the placenta, the patient bled considerably and had a second ampoule of pituitary extract in addition to the usual pituitary and ergot medications. The total loss of blood was estimated at 350 c.c.; and one hour after delivery the patient was back in bed with uterus firm and bleeding very slight.

Four and one-half hours after delivery, however, the patient had a third degree postpartum hemorrhage estimated at 1200 to 1500 c.c., and was returned to the delivery room for tamponade. Under light drop ether on open cone (about 2 oz.) the

*Read by invitation before the Obstetrical and Gynecological Section of the New York Academy of Medicine on March 26, 1929.

uterus was explored, then packed with 8 yards of two-inch gauze packing impregnated with about 7 per cent of iodoform, the remaining two yards of the one strip being packed into the vagina. During the operation she received 200 c.c. of gum glueose intravenously and within the next thirty minutes 500 c.c. of whole blood. Her condition subsequently was never dangerous.

This report was suggested by the occurrence fifty-four hours after delivery, forty-eight hours after the tamponade, of a rash on the face. Appearing first on the right side, within five hours it involved both cheeks, bridge of the nose, circumoral region, and chin; but at no time was there the least abnormality of the skin of the rest of the body. At first herpetiform and papular, it soon became vesicular and finally resembled a moist eczema. Itching and burning were present with variable intensity; but although many vesicles were found inside the mouth and on the tongue, there was no complaint of bad taste or anorexia, nor was there any bad odor of the breath. Unfortunately no iodine tests were made on the urine or saliva. Dr. A. B. Cannon, called in consultation, made the diagnosis of dermatitis medicamentosa, probably absorption from iodoform dressing, and recommended light diet, forced fluids, saline laxatives, sodium chloride, gr. 5, t.i.d., a mouth wash, and a lotion for the face.

The packing was removed, 4 yards in forty hours, 3 yards in fifty-eight hours, and the remainder seventy-seven hours or three days and five hours after the tamponade. The temperature never rose above 99.6 degrees by mouth, the pulse rose to 120 on the second day postpartum, then gradually fell to 90 by the fourth day. Respirations normal throughout. The rash remained at its height for three days; then it gradually dried up, but persisted as red blotches with irregular desquamation until discharge from the hospital on the fourteenth day. No vestige remained at her first follow-up visit, twenty-five days after delivery.

DISCUSSION

This case is presented, first, because of the infrequency of iodoform poisoning, especially of its skin manifestations in modern obstetric and gynecologic practice; second, because its distribution was limited instead of generalized; and third, because the usual mental depression, refusal to take food, bad taste in the mouth, foul breath, very high or very low temperature, rapid weak pulse, and appearance of general intoxication were here conspicuously absent.

Finally to repeat the caution⁵ expressed many years ago, the least possible quantity of iodoform should be used, renewed only very rarely and removed at the first sign of intoxication. Extra precautions should be observed in the case of obese or debilitated, very young or very old subjects, or those affected with cardiac or renal disease. As a logical part of these precautions, the present widely varying strengths of iodoform packing and methods of its preparation should be standardized.

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SPECIAL ARTICLE

A REMINISCENCE OF AN EPISODE IN THE HISTORY OF THE SLOANE HOSPITAL*

BY BARTON COOKE HIRST, M.D., F.A.C.S., PHILADELPHIA, PA.

IT IS a great honor to be invited to address the Alumni of the Sloane Hospital for Women, one of the world's centers for the study of gynecology in its modern and correct sense, the study in close correlation of all the conditions peculiar to women. The invitation was welcome to me for another reason. From its earliest beginnings I have had a special interest in this institution, more so than in any of the others in this country, except the one I had the opportunity to found and develop in Philadelphia. It was my fortune besides to be indirectly connected with a critical period of this hospital's history under the mastership of Dr. Cragin, whose friendship and counsel I enjoyed during the greater part of his professional life.

Edward Bradford Cragin's name should always be held in grateful recollection by the Alumni of the Sloane Hospital. His leadership during an important epoch in its development had a far-reaching influence, not only on this hospital but on all the others of its kind in America. Had his action been unwise, his energy misdirected, the progress of gynecology in America might have been retarded, perhaps for a generation.

At the time to which I refer both he and I were striving for the same ends, endeavoring to solve the same problems and encountering the same difficulties. We were in frequent consultation as to the best mode of procedure. His course was admirably chosen. He had the faculty of clear thinking and the ability to express his views lucidly, concisely and convincingly. He was tactful and diplomatic. He had the *suaviter in modo*, supported when occasion demanded it by enough of the *fortiter in re*. With all these qualities, he was the right man to be at the head of the Sloane Maternity Hospital when its affairs demanded such a leader.

My conduct, I fear, suffered in comparison. It certainly was cruder and was never entirely successful in getting the results he obtained with the minimum of friction and in an amazingly short space of time. In looking back at this period the question has come in my mind whether a part of Cragin's success was due to the alert, intelligent, progressive city in which he lived, while I had to butt my head against the ultraconservatism of a community justly famed for its indisposi-

*Address delivered at a meeting of the Sloane Alumni Society, November 1, 1929.

tion to do anything in a hurry. But this is probably a subconscious effort to escape confessing my tactical inferiority.

I have just read, with mingled feelings of pleasure and trepidation, Dr. Williams' charming sketch of the development of the Sloane Hospital, delivered at the last annual meeting of the Alumni Society. It would have been with unmixed pleasure, had I not rashly undertaken to be his successor this evening.

When Dr. Williams presents a subject in his inimitably graceful and thorough manner, he leaves his followers in the uncomfortable position of having nothing left to say. But in his delightful address, for some reason of his own nothing was said of the crisis in the history of the Sloane Hospital to which I have referred. I venture to hope, therefore, that a brief account of this episode in its history might be an acceptable addition to the annals of this hospital.

To understand the situation that developed shortly after Dr. Cragin took charge of the Sloane Maternity Hospital, one must look back a generation or two to conditions of medical practice unfamiliar to the younger members of this body. There is in my mind a picture of two figures in Philadelphia, typical of their contemporaries and immediate predecessors, Elwood Wilson and Albert Smith, he of the Smith-Hodge pessary, both devoting their professional lives to the care of women in childbirth with a good deal of general practice in addition, especially among women and children. They were much alike in their professional attitude and resembled closely in this respect all their fellows. Grave, dignified, with a perfect bedside manner, they were as conventional in their dress, speech and behavior as the most orthodox parson.

Even Dr. Fordyce Barker, who lived in princely style in New York in the early eighties, had something of this professional conventionalism about him, although he was a man of the world, accustomed to the best society. His house was a stately mansion reminding one of some of the old London houses of the Victorian era. I have good reason to remember his cordial hospitality, his extreme kindness to a totally unknown and unimportant youngster. The practice of these men was limited to patients in their own homes, necessitating long hours of attendance on each confinement case in a private house. A laborious life with little leisure for study, investigation or research, and none at all for the peripatetic philosophy in medicine advocated by Osler for acquiring a broad knowledge of what is going on in the medical world.

According to our views at present, they should have been capable of dealing with all the anomalies, complications and consequences of the process of generation, necessarily including all the possible diseases of women. But they had no hospital facilities, no hospital training, no surgical experience or ability.

It was in the lifetime of such men as these that there appeared on the medical horizon, you remember, the important discoveries in the

surgical treatment of diseases of women. Conditions in increasing numbers that had never in the whole history of the human race been amenable to any treatment, were found, as you know, to be curable by surgical means. Now the men in this country who had had these conditions under their observation as an integral part of their practice, were pathetically incompetent to keep pace with modern progress and had to stand helplessly aside while others took up the work that should have been theirs.

It was not an easy task for any one, this launching out on an uncharted sea, adopting means of treatment at first looked upon askance by the bulk of the profession and actually denounced by those in the seats of the mighty as subversive of their teaching and practice. Washington Atlee was assailed as an assassin for his ovarian cystectomies. Many of his colleagues refused to meet him in consultation. A famous medical teacher and writer of his day in Philadelphia actually demanded Atlee's arrest during one of his operations. It required, therefore, a special type of man to take up gynecic surgery and to give it a recognized place among legitimate surgical procedures: a pioneer type, bold, aggressive, domineering; a free lance, unfettered by precedent, unsubmissive to constituted authority, with a trace of ruthlessness toward his less progressive fellows; something in him of the old conquistadores.

These pioneers, Ephraim McDowell, Marion Sims, Emmett, Atlee, Spencer Wells, Lawson Tait, Goodell, Joseph Price, and their like, having carried their point, demonstrating the necessity for gynecic surgery in the treatment of many of the diseases of women, instead of the old, futile palliative measures, found themselves in an enviable position. Comparatively few in number, besought by an apparently inexhaustible number of patients for relief not previously obtainable, they were richly rewarded for their services and acquired a brilliant reputation.

There was no field in medicine a generation ago that appeared so alluring to those possessing the qualities essential to success in it, as so-called gynecology. The unjustifiable usurpation of this name for their work, by the way, and of gynecologist for their title was quite characteristic of the men who had taken it up. We now see plainly enough that gynecopathy and gynecic surgery are relatively minor parts of true gynecology, with a steadily diminishing scope, due to the decrease of injuries, displacements and infections as the hospitalization of maternity cases increases. The act of reproduction with all its anomalies, complications and consequences must always be the major subject in a study claiming to include all the conditions peculiar to women. Why not give an appropriate name, then, like gynecematology to this major branch of gynecology, to indicate what it really means,

instead of the absurd midwifery, obstetrics, lying-in, Geburtshülfe, accouchement, which have lost their original significance?

Well, the self-styled gynecologists had their way for awhile, creating the impression, not only in the profession but in the minds of the general public also, that they had the sole prescriptive right to the treatment of diseases in women requiring surgical measures.

Now on a stage thus set, with one group of men superintending the act of childbirth and another engaged mainly in patching up its consequences, there appeared a new factor in the scene, the modern maternity hospital, of which there had been a disgraceful deficiency in this country, a hospital equipped for the study, teaching and treatment of the process of generation with all its anomalies, complications and pathologic consequences. The Sloane Maternity Hospital may claim to have been the first of these modern hospitals. It had been preceded by a few others deliberately established for teaching students in addition to their charitable work, but they were small affairs, usually in converted dwelling houses, lacking permanency, without influence on the medical profession at large and practically unnoticed by the general public. William Shippen, Jr., I believe, should have the credit for the first maternity hospital deliberately designed for teaching students the art of delivering women. On January 31, 1765, there appeared in the *Pennsylvania Gazette* the accompanying advertisement.

In 1810 James was conducting demonstrations to a class of students in the Philadelphia Hospital.

Williams gives priority to the hospital established in 1822 by the College of Physicians and Surgeons of Baltimore, as the first to be devoted primarily to the training of students, but as you have heard, Shippen's hospital antedated the Maryland institution by fifty-seven years. It was in the Hospital of the University of Maryland in 1887 that Williams saw one of the two deliveries he witnessed before graduation. He was more fortunate than I. It was two years after I received a medical diploma that I first saw a woman in childbirth and that was in Berlin. The only opportunity I might have had for such an experience I missed while a student in Philadelphia. Albert Smith gave a voluntary course in the out-patient department of the Lying-In Hospital, consisting mainly of didactic lectures but with an occasional assignment to an actual patient in her home. Assigned to such a case I was summoned one night. Answering the call with my head filled with a lot of ill-digested theoretic knowledge and in a dreadful state of panic, I forced myself to mount the front doorstep and pull the doorbell, but before the bell could be answered, what little courage I had left deserted me. I turned tail and ran away.

The Lying-In Hospital of Philadelphia is now in the 103rd year of its continuous existence, the only one of its kind in America, I believe, that can make this claim. For many years inadequately provided with

Doctor S H I P P E N, junior,

HAVING been lately called to the Assistance of a Number of Women in the County, in difficult Labours, most of which were made so by the unskillful old Women about them, the poor Women have suffered extremely, and their innocent little Ones were entirely destroyed, whose Lives might have been easily saved by proper Management. And being informed of several desperate Cases in the different Neighbourhoods, which had proved fatal to the Mothers, as well as their Infants, and were attended with the most painful Circumstances, too difficult to be related. He thought it his Duty, from a desire to begeth an intended Course of Lectures by Mr WILKINSON, and the several Students Appointed for that Purpose, to give a short History of the Diseases which have had Virtue enough to overcome the Assistance, and apply to Administration, as well as all the best Books, Sentences, and Rules in the Study of that art, and to receive the Assistance of Surgeons, and to receive the Assistance of all the Members of the Faculty of Medicine in the County, with the Faculty of Physicians, and Surgeons.

The Doctor's Office is at the Hill Street, London, in the Parish of St. Martin's, in the County of Middlesex, and is open daily, from nine o'clock till five. A Doctor will continue to be at the Hill Street, in the County of Middlesex, from nine o'clock till five, and will continue to be at the Hill Street, in the County of Middlesex, from nine o'clock till five, and will continue to be at the Hill Street, in the County of Middlesex, from nine o'clock till five. The Doctor's Office is at the Hill Street, London, in the Parish of St. Martin's, in the County of Middlesex, and is open daily, from nine o'clock till five. A Doctor will continue to be at the Hill Street, in the County of Middlesex, from nine o'clock till five, and will continue to be at the Hill Street, in the County of Middlesex, from nine o'clock till five.

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proper facilities for its work it is now under the superintendence of Drs. Piper and Vaux, housed in as fine a hospital building as can be found anywhere, with ample provision for gynecic surgery.

The Boston Lying-In Hospital incorporated in 1832, after a brief career seems to have lapsed till 1873, when it resumed operations in a converted dwelling, purchased for \$16,000, the trustees having had a disastrous financial experience with a building constructed as a hospital.

A year after the opening of the Sloane Maternity Hospital in 1888, there appeared the small beginnings of a similar institution on the hospital grounds of the University of Pennsylvania. This infant project of mine, designed for a purpose to which the country was not accustomed, after a lapse of many years since such a place had first been established, had at the start a stormy struggle for existence. We had to contend with an almost insane prejudice and animosity in many people, a state of mind strangely out of accord with the end of the nineteenth century. We look back on it as one of the evidences of a provincial ignorance, cropping up here and there in the United States, that has been, and, to a lesser degree, still is, a blot developed here on the civilization transplanted from Europe to this continent, a sign of sporadic decadence, bred in our isolation from the original source of all our culture, of which we can recall many examples in our political and social life.

In a report from the Sloane Hospital some years after its foundation, there appears a statement that the original building, three stories high, accommodating only twenty-eight patients, was the greatest plant for obstetrics in the world, a declaration worthy of Mr. Jefferson Brick, a revelation of the provincial mind with the braggadocio often accompanying it. I remember distinctly a member of the staff of the Philadelphia Hospital being immediately discharged for daring to exhibit a forceps operation to a class of medical students, although the patient was anesthetized and unconscious of the exposure, and it was not more than twenty-five years ago that a woman, prominent socially in Philadelphia, told one of the University trustees that she had organized a committee of women to set fire to the University Maternity Hospital. This feeling, while it seems to us now an ignorant prejudice, worthy of the Middle Ages, was not altogether unreasonable. At least we must make allowance for it. It was an inherited prejudice coming down through countless generations from an age in which it was punishable by death for a man to intrude on the privacy of a parturient woman. It would be well for us to remember this.

The same feeling lies dormant in the female brain today and might be awakened by sufficient cause. It is not likely that this country will ever have the callousness about this matter that is seen in some of the

large hospitals of Continental Europe, but a word of caution to the younger assistants and house officers is not out of place.

In developing the modern maternity hospital we had to face another, a more insidious, a more serious opposition than the prejudice of women against the undue exposure of their sex. In the rise of the new maternity hospital the gynecopathists of the country immediately sensed a danger to their profitable monopoly of a lucrative branch of gynecology. They saw plainly that, as in Europe, these hospitals would command the clinical material to which they claimed an exclusive right and that consequently their narrow specialty was doomed eventually to extinction. They were also aware that the kind of physician required for the head of these new institutions must have a training fitting him to do all that they did and a great deal more, and would not be the sort of person supinely to submit to a deprivation of work that was legitimately his or to be thrust aside into a position of inferiority. Hence, there arose an effort to suppress the heads of these new hospitals and to restrict their work by methods that, to put it mildly, were not commendable. They savored indeed of the bitterness always engendered by an attack on entrenched special privilege, or an attempt to overturn an established order.

Cragin was forbidden to do any surgery in the Sloane Maternity Hospital. He was not even allowed to do a secondary perineorrhaphy, although the original injury had occurred in his hospital.

At a meeting of the medical faculty of the University of Pennsylvania at which I was present, a resolution was adopted forbidding me to operate on any condition in the new maternity hospital, except on one that had arisen in the patient while she was a resident in the hospital, and you remember the acrimonious dispute between Williams and Kelly of Baltimore as to who should repair a complete laceration of the perineum that had occurred in Williams' service. Thus the immediate successors of the men who at first had been subjected to the most violent abuse and the most determined efforts to suppress them, in their turn tried to stifle their presumptive rivals. One is reminded of the Puritans after their arrival in Boston. Just escaped from religious persecution themselves at home, they cropped the ears of the Quakers or hung them for trespassing on their theologic preserves. The *odium theologicum* we agree is the worst hate of all, but there have been periods of medical history in which the *odium medicum* was almost as bad.

The edict addressed to me by the medical faculty was ignored. The maternity hospital continued as before to have a very active gynecic surgical service with long operative clinics three times a week, exhibiting mainly all the possible pathologic consequences and complications of pregnancy and labor, immediate and remote, surely a legitimate

part of such an institution's work, but incidentally embracing gynecology in its entirety.

A few years later the same resolution was adopted again by the medical faculty and again met with the same response. How Cragin met and defeated the envious attempt to restrict his work I never exactly knew. One of the moves of his diplomatic campaign was to invite me to New York to read a paper on the equipment and scope of the modern maternity hospital, which he told me later he had shown to Dr. Butler and the trustees of Columbia. The next thing we knew, a few years later, Cragin had an addition to the Sloane Maternity Hospital for dealing with all the diseases of women, and we found him in the enviable position of master of the Sloane Hospital for Women with no rumblings of protest or opposition that we at least had heard at a little distance. An invitation was sent me to attend the formal opening of the new hospital with its recent addition. It was difficult, I confess, to conceal the envy I felt at what I saw.

My affairs were obviously not so diplomatically managed, for to the end of my incumbency as a teacher of the undergraduate students, I had constantly to resist the persistent attempts to limit my teaching and practice. As a member now of the Faculty of the Graduate School of the University of Pennsylvania and of the Staff of the Graduate Hospital, which is organized on modern lines, my difficulties are ended.

These stormy days of the past are now over for all of us. With the exception of one or two reactionary places, the principles embodied in your institution are generally accepted throughout America, as they have been for a much longer time in Europe. You of the younger generation, with your feet planted firmly on the solid earth, can look back with equanimity, and I hope a little sympathy, at your predecessors struggling in a tempestuous sea. It is plain sailing in the future for you.

Naturally progress will not cease. Changes are to come but nothing, I think, as revolutionary as in the recent past. There is ample room for further development in enlarged hospitals with a much greater capacity, in implanting in the public mind an appreciation of the great advantages of the hospitalization of all maternity cases, in improved technic and equipment, in closer cooperation with all the other branches of medicine, in provision for laboratory and clinical research and for animal experimentation.

Under the able leadership of the present master, the country at large, and especially those of us who have watched with admiration this hospital's growth from its beginning to its present imposing position, will confidently expect the Sloane Hospital for Women to remain a bulwark against reaction, a stronghold for the continued evolution of true gynecology. We will look to it for further contributions to our stock of knowledge, like Cragin's demonstration of what can be done

by the conservative treatment of placenta previa, the studies in Studdiford's time of the injuries of the fetus in head-last labors and their prevention.

There is one thing I have always had much at heart, which I attempted once to accomplish, to which I beg to call the attention of my friend, Dr. Watson. It seems to me that the time has come to bring about a closer cooperation between the important hospitals for women in Canada and the United States. In travelling about the country to visit these institutions, one is impressed with the lack of unanimity of opinion as to the best way to utilize their resources and a lack of uniformity in practice as to the best methods of teaching. No one would advocate too rigid a standardization, but would not the conditions in this respect seen in Germany, Austria, Switzerland and Scandinavia be preferable to our exaggerated individualism, which obstructs the development of a national school of gynecology here?

If I am right in advocating an association of special hospitals for women, with frequent conferences of their executives, both lay and professional, which should raise the average level of them all, the Sloane Hospital for Women, the first specially constructed and adequately equipped woman's hospital, is well fitted to take the lead in such a movement. Whatever may be done in this and in other matters to further our advance in one of the three great divisions of medicine, we may congratulate ourselves on the outlook. If we consider what has been accomplished in a single generation, the future looks bright indeed if anything like the same rate of progress continues. To paraphrase a boast of old chauvinistic England, much chastened in this respect of recent years, we have the men, we have the hospitals and we have the money too. With all our advantages, it will be much to our discredit if, in the near future, we do not make our hospitals for women the models for the rest of the world to copy.

1821 SPRUCE STREET.

Society Transactions

NEW YORK OBSTETRICAL SOCIETY

MEETING OF NOVEMBER 12, 1929

DR. R. A. HURD read a paper entitled **Observations and Conclusions on Plastic Operations at the Woman's Hospital.** (For original article see page 633.)

DISCUSSION

DR. GEORGE G. WARD.—Perhaps we are to be congratulated at the Woman's Hospital in the fact that we have four gynecologic divisions there, each in charge of a surgeon with his assistants, and each man entirely free to work in his own way and to solve the problems that come to him as he seems to think best. I believe that is the only right way to make progress, because a man will get one point from one surgeon, another point from another and so on. Probably no one surgeon is 100 per cent accurate in his work. Therefore, Dr. Hurd has had the opportunity in the Woman's Hospital to study the various methods used in the different divisions which vary one from the other in the way they handle these problems. Of course, it must always be remembered that there are "many roads leading to Rome," and most of them get there, so that one man may succeed perhaps with one method and another man may also succeed with a method that may differ.

The operation that Dr. Hurd emphasized for cystocele is practically the principle laid down by Hadra of Texas many years ago, and which was described by Dr. Noble in Kelly and Noble's work on Gynecology. It was Hadra who first advocated the loosening of the bladder and shifting it higher up, in the identical way that Dr. Hurd has described, and the suturing of the anterior vaginal wall through its entire thickness was done by Noble and by men following that technic.

I think one of the most valuable things that Dr. Hurd brought out is the method of approach, which Dr. Byron Goffe has stressed, first on the posterior vaginal wall, of getting into the line of cleavage by going *above* the fusion point which is at the perineum on the pelvic floor. The same applies to the anterior vaginal wall, not attempting to enter the line of cleavage too near the external os where there is a fusion of tissues and difficulty in getting into the cleavage plane. Likewise by not attempting to get in near the urethra a point which has been recognized by many plastic surgeons before. In some of my own work many years ago, on vesicovaginal fistula of the inaccessible type, the principal thing I brought out in the paper that I presented at that time was that in attempting to do a flap operation for vesicovaginal fistula you should get the line of cleavage a long way from where the fistula was, down in the part of the vagina free from scar tissue, and that when you once get into the line of cleavage you work your way up, practically in the same manner that Dr. Hurd has emphasized, by getting into the anterior wall and getting into the fascial plane above the endofascial structures. That is the most important thing he has brought out in his paper in my opinion, and certainly for those not experienced in plastic work it will be a very great aid in helping them to learn how to separate these structures without damage.

DR. DOUGAL BISSELL.—The points in this discussion which really interest me are not those pertaining to priority with respect to particular steps in the perfection

of the varied operations under consideration but those pertaining to the pathology, etiology and surgical technic.

Before pathologic anatomy can be understood, normal anatomy must be understood; the same may be said of etiology and surgical repair.

The normal relationship between the inferior muscle wall of the bladder and the anterior or superior muscle wall of the vagina is of vital importance. If this area is dissected under normal conditions, it will be found that it is difficult to determine the line of demarcation except near the cervix, where the bladder, vaginal wall and cervix meet. In this area only is there normally a somewhat loose connection. If one dissects this region expecting to isolate a distinct fascial layer between these organs, such a layer as can be used independently for reconstruction purposes, he will be disappointed. The fixed points of the intraabdominal fascia, a fascia which gives support and stability to all of the abdominal and pelvic organs, are first, the thoracic diaphragm above, the umbilicus in front, the entire spinal column behind and the white line on each lateral wall of the pelvis. From the white lines on the pelvis the fascia disperses through the pelvic tissues, and that portion known as the vesical portion is not an independent fascial layer but ramifies into many thin divisions forming cellular covering for the blood vessels, nerves and muscle tissue, and are recognizable only through the microscope.

The degree of cystocele, in my opinion, depends chiefly upon the extent of the injury to the tissues between the vesical and vaginal muscle walls resulting in the loss of intimate relationship between these muscle layers. If this theory be correct, the pathology of a cystocele centers on the line of demarcation between the two muscle walls; and the first point of interest in the technic of surgical repair is the method of approach to this injured area. The common method of approach is by a longitudinal incision through the anterior vaginal wall from a point near the base of the urethra to a point near the junction of the vaginal wall and the cervix. It not infrequently happens that the anterior vaginal wall is greatly hypertrophied when a cystocele exists. Under these circumstances the operator may find it difficult, when using the longitudinal incision, to determine the line of cleavage between the bladder and vaginal wall and will follow artificial lines of dissection in the thickened tissue. In the technic I have developed for the cure of cystocele, I reach the line of cleavage between the bladder and vagina through a transverse incision of the anterior vaginal wall at a point near the junction of the anterior wall and the cervix; here, as I have said, is found normally a somewhat loose connection, and when injury occurs resulting in a cystocele, the looseness is increased, and if this point is used for the initial incision we will find in cutting through the entire vaginal wall a definite and enlarged space beyond with more or less loose connective tissue.

The anterior vaginal wall is grasped in its middle line near its juncture with the cervix by two Allis clamps placed longitudinally and half an inch apart; then with scissors a deep incision is made through a tent-like fold of the lifted vaginal wall, and when the scissors pass completely through the wall, a bloodless space is entered. The limits of this space usually take on a glistening appearance and at times make one think he has entered the peritoneal cavity. From this point on, the separation of the bladder from the vaginal wall is easily followed in every direction.

Since 1917, when I first became interested in this work, four pathologists made numerous studies for me of the microscopic structure of the excised portions of the anterior vaginal wall (the same statement is applicable to the posterior vaginal wall), and in no instance were they able to define a layer of fascial tissue. It is, therefore, my conviction that we are in error if we teach that there is a definite

fascial layer which can be isolated and utilized for surgical repair, and further that the term fascial-lapping as applied to reparative work on the vaginal wall is a misnomer.

DR. REGINALD M. RAWLS.—It seems to me that the crux of the whole matter is the plane of cleavage. The cleavage plane was first demonstrated in the Woman's Hospital by J. Marion Sims in a very difficult cystocele. This required a more serious operation than had been contemplated, and Sims had to obtain permission of the Board of Governors, because his idea was that to cure the cystocele he would make a large vesicovaginal fistula. He felt sure he could cure the vesicovaginal fistula but was not so sure of the cystocele. He then cut out the herniated bladder as he thought and devised some large phimosi clamps for the purpose. His idea was that he would thus control the bleeding of the bladder when he dissected out or cut off the portion of the bladder. He pulled the cystocele through the phimosi clamps and cut it off. He took off the clamps and saw that he had not made a vesicovaginal fistula but had entered the cleavage plane. That was the beginning of the cystocele operation because the bladder had retracted back, and he had the denuded edge of the vaginal wall on either side, which he brought together with sutures. So we can even go back beyond Hadra's time. Hadra's principal contribution to cystocele was the elevation of the bladder and the fixation of the descended bladder on a high level. This, as Dr. Ward says, was afterward taken up by Noble. So I feel the crux of the whole matter is to get the cleavage plane. Dr. Bissell entered it one way. I previously had entered it for the cystocele operation by an incision from the urethra to the cervix, but at the same time it seemed wise to me to cut through the whole vaginal wall and demonstrate the bladder, which I could push off and be sure I was in the cleavage plane.

I would like to differ with Dr. Bissell and still further modify it and call it a lapping of the contents of the anterior vaginal wall, because, unquestionably, when we come to this cleavage plane we expose a thin intracellular fascial layer that was so well demonstrated by Dr. Hurd. Therefore, if I should ever be tempted to write again on cystocele, I would like to make a modification of not lapping the fascia independently of the anterior wall, because I feel sure that I never have done that but have always lapped the contents of the anterior vaginal wall for cystocele.

DR. BENJAMIN P. WATSON.—Dr. Hurd has given an excellent description of the anatomy of the pelvic structures, and especially of the anatomy of the pelvic fascia, but why he should then deny that there is any fascia I do not know, because that is what it amounts to. Whether we call this fascial layer by one name or another is mere quibbling. You can separate a distinct layer of tissue in cystocele with a definite line of cleavage between the anterior vaginal wall and the bladder and trace it very definitely up to the back of the pubis and down to the cervix, the pubocervical layer, which contains fibrous tissue, elastic tissue, and a considerable amount of nonstriated muscle tissue. I, personally, have always made use of that layer—call it fascia or whatever else you like—in the repair of cystocele, for two reasons, first, because when the bladder is pushed well up off the supravaginal cervix and into position, if that layer is separated you can get it well over the bladder with less tension than if you take in the whole thickness of the vaginal wall. The second reason for using it is that at least 50 per cent of the cases of cystocele have incontinence of urine, and by lapping that fascia around the neck of the bladder one can, in my experience, cure 90 per cent of those cases. I do not think you can get anything like that proportion of cures if you depend on the thickness of the vaginal wall to get that bracing of the neck of the bladder up behind the symphysis pubis which is the essential thing in the operation.

Dr. Hurd stated that he thought the Kelly operation was the best for these cases of incontinence. I have found that operation inadequate. My idea of the incon-

tinence of urine in those cases is that this fascial layer has so given way that the neck of the bladder, with the sphincter, is no longer braced up at the back of the pubis. The sphincter has no longer a fixed point from which to act. If you can restore the neck of the bladder to that fixed point behind the pubis, the patient will have continence. How that can be done by taking the whole thickness of the bladder wall I do not see. At any rate, it cannot be so well done as when the fascia is separated and then brought over.

DR. WILLIAM A. JEWETT.—The question at issue as to whether one is dealing with fascia or muscle makes very little difference. We have in the anterior wall definite structures that are supporting which can be brought together under the bladder separately from the mucous surface, and I believe that sometimes this supporting structure is lacerated transversely and sometimes it is lacerated antero-posteriorly. I recall that the late Dr. Watkins claimed that in a large number of the injuries of the anterior wall the split in this supporting plane was a transverse split. He therefore closed it transversely because he believed that this resulted in restoring of the structures to the position they had previously occupied. Most of us do the operation as has been described by bringing the supporting structures together from side to side and then closing over the mucosa.

DR. SAMUEL H. GEIST.—We have recently been utilizing a rather old and possibly more or less forgotten method at Mt. Sinai Hospital for a very select group of patients with a moderate or large cystocele who have to have some intra-abdominal surgery done, such as a hysterectomy, a myomectomy, or removal of any intraabdominal tumor. In such cases after the intraabdominal operation is completed, we have been fearful that the pull on the cervix necessary for carrying out the plastic operation might jeopardize the sutures or ligatures that have already been placed in the abdomen. On the other hand, we have felt that if the vaginal work is done first, the intrauterine manipulation might jeopardize the security of the vaginal sutures, so that we have selected in such cases the Polk operation, which is done after the necessary intraabdominal procedures have been completed, by stripping back the bladder, as one would do for a complete hysterectomy, and uniting the pubocervical fascia with interrupted chromic catgut sutures, tying the lower suture first and including the cervix in the uppermost one or two sutures. Usually four sutures can be used.

We have had 14 cases done by this method and which have been followed six, eight, and some perhaps ten months. While some of them have not been satisfactory, I think the proportion of successes thus far compares favorably with the approach from below, and this method obviates a possible source of danger in doing the operation by the combined abdominal and vaginal route.

OBSTETRICAL SOCIETY OF PHILADELPHIA

STATED MEETING, OCTOBER 3, 1929

Dr. W. F. HARRIMAN exhibited a Bipolar Electrode for Application to the Cervix Uteri, which was devised by Dr. F. M. Ende of New York and described in the July, 1929, issue of this Journal. Dr. Harriman commended the procedure and stated it had given him good results, without complications.

Dr. MARGARET C. STURGIS presented a paper entitled *The End-Results in Ten Cases of Hydatidiform Mole Treated by Curettage*. (For original article see page 641.)

DISCUSSION

DR. BROOKE M. ANSPACH.—There are two cases of this condition that stand out prominently in my memory. In one the patient had pernicious vomiting. A therapeutic abortion was necessary. In an examination under anesthesia (the patient was difficult to examine otherwise), I found the left ovary enlarged to the size of an orange, adherent in Douglas' pouch. After opening the abdomen I did a hysterotomy and to my surprise there was an hydatidiform mole. The uterine wall was entirely healthy. I cleaned the uterine cavity thoroughly with my finger and gauze and closed the incision. The right ovary was enlarged as much as the left but lay well above the pelvic brim. I removed the left ovary which was torn in releasing it from the pelvis. Two months later the patient started with irregular bleeding and then there slowly developed in the anterior wall of the uterus on the right side a definitely palpable tumor. A diagnosis of chorionepithelioma was made, based on the development of the uterine tumor and the recovery by diagnostic curettage of proliferating chorion cells from the uterine interior. A complete hysterectomy was done. At that time the ovary on the right side had shrunken to a size below the average ovary.

In the other case the patient had passed an hydatidiform mole and then kept on bleeding. An examination of the scrapings showed cells that suggested a tendency to malignant change.

In order to prevent the development of chorionepithelioma, we used 50 milligrams of radium inside the uterus for twelve hours. There were no further symptoms and two years later the patient gave birth to a normal full-time child, who has subsequently grown to healthy manhood. Four or five years ago the patient developed a myoma of the fundus for which a supravaginal hysterectomy was done.

DR. WELDEN.—In the last five years I have encountered five cases. Two of them were about three months' pregnant, and the growth had been very extreme. I noticed in all my cases the markedly toxic condition of the patient and the rapid and extreme loss of weight. One patient had gone down from 150 to 95 pounds with a three months' mole, but within four months after I had curetted, she had regained all she had lost. This woman was the only one who became pregnant and she had a baby with a large spina bifida. All of them made absolute recoveries.

As to the symptoms, two of them I diagnosed by loss of weight and toxic condition, without the usual findings of the laboratory, but they all complained of an extreme internal pressure pain of a bursting type, rather than the ordinary pain of pregnancy.

DR. DANIEL LONGAKER.—In an experience of six cases the following points have impressed themselves on my mind: first, difficulty of diagnosis; second, the frequency of vomiting and evidences of toxemia.

I have made it a uniform practice to do an immediate curettage and follow this up with a subsequent curettage a month later. The scrapings are carefully studied microscopically.

The most recent case looked very suspiciously like a chorionepithelioma at this second curettage, but as nothing had been said to the family about the possible necessity of a radical operation like hysterectomy, we limited ourselves to the removal of a section of the posterior lip of the cervix and scraping of the involved posterior vaginal wall, with deep cauterization of the involved area with the galvanocautery. The microscopic study showed the invasion was not a chorionepithelioma.

In my own experience no case of chorionepithelioma developed.

DR. J. STUART LAWRENCE.—It may interest Dr. Sturgis to know the St. Mary's experience. In about 2000 cases, we have had four hydatidiform moles. None of these was diagnosed absolutely. Two of the cases were unusual, in that they occurred in one individual, and in between the attacks there was a normal pregnancy.

All four of the patients are alive, and have not been followed by chorion-epithelioma.

DR. STEPHEN E. TRACY.—Three cases of hydatidiform mole have come under my observation. One patient was referred to the hospital as a case of marked toxemia of pregnancy. One morning, two or three days after admission, there gushed from the uterus a large quantity of dark blood. The uterus was explored and a hydatidiform mole was found and removed. The toxemia cleared up promptly and the patient was discharged from the hospital in good condition. About two months later she returned to the hospital because of uterine bleeding. A diagnostic curettement was performed. The material from the uterus was examined histologically, and the pathologist reported the lesion to be chorionepithelioma. The slides were submitted to an expert gynecologic pathologist who agreed with the diagnosis and requested that he be given one-half of the uterus when it was removed. It was recommended that the patient have a complete hysterectomy. The family physician did not approve of such a procedure and the mother of the patient agreed with him. The doctor stated that he would keep the patient under close observation, and give her local treatments. The patient was seen a few months ago, more than fifteen years after the diagnosis of chorionepithelioma was made and she was enjoying excellent health.

DR. WILLIAM R. NICHOLSON.—I have felt that Dr. Schumann's work which has been mentioned was too radical, at least as far as my experience has gone. I have never seen a chorionepithelioma following a hydatidiform mole. I have seen some few cases of the latter in the last twenty years but had only one chorionepithelioma, which followed an ordinary miscarriage. I think Dr. Tracy's remarks in the discussion should be accentuated. I, too, have had the experience of submitting tissue to an extremely well-trained pathologist and receiving the report of chorionepithelioma, but the subsequent course of the case proved that the diagnosis was mistaken. It is not easy to make this pathologic diagnosis in all cases and the pathologist feels his responsibility very greatly and for this reason there is a tendency to report malignancy in cases which at least are doubtful from the pathologic side. This should be borne in mind by the clinician in interpreting the reports made from the laboratory.

DR. GEORGE W. OUTERBRIDGE.—In line with what Dr. Tracy said, I have never forgotten a case which I saw many years ago while working in the laboratory of Gynecological Pathology at the University with Dr. C. C. Norris. This was a uterus, not merely curettings, in which we found an extensive invasion of syncytial wandering cells throughout the musculature. There was some doubt in the minds of Dr. Norris and myself as to the presence or absence of malignancy, and we agreed to send sections to three pathologists for their opinions. We received three different answers: one was to the effect that the case was unquestionably benign, the second, that it was unquestionably malignant, and the third, that it was quite impossible to say.

DR. CHARLES MAZER.—The only case of chorionepithelioma I have seen followed an abortion. Thirteen follow-up cases of hydatidiform mole, treated at the Mount Sinai Hospital during the past twelve years, are well. One of these cases developed two huge theca lutein cysts which produced pressure symptoms to an extent requiring removal.

DR. JOHN M. LAFERTY read a paper entitled **A Test of Labor**. (For original article see page 647.)

The discussion was participated in by Drs. Lawrance, Boyd, Longaker, Hanna, and Nicholson.

BROOKLYN GYNECOLOGICAL SOCIETY

MEETING OF NOVEMBER 1, 1929

DR. J. P. GREENHILL, of Chicago, Ill., read a paper (by invitation) entitled **An Analysis of 874 Cervical Cesarean Sections Performed at the Chicago Lying-In Hospital**. (For original article see page 613.)

DISCUSSION

DR. CHARLES A. GORDON.—Cesarean section apparently is considerably on the increase in Chicago. It was my impression that the great wave of enthusiasm for cesarean section was waning. Apparently not. In the total admissions from one large clinic in Chicago the incidence is very much larger than that in our Brooklyn hospitals and possibly New York.

Not so long ago our Society analyzed 1805 cases of cesarean section over a five-year period from thirty-four hospitals. Dr. Greenhill has presented a series of 874 for ten years from one hospital, it is true, with an incidence that has steadily risen until it was 3 per cent for the last year. In my experience with services covering something over 2000 cases yearly the incidence was 1-140 as against his 1-33. We might possibly do 10 or 12 cases a year—our numbers could never possibly run into the hundreds. After examining the indications given this evening, one could hardly quarrel with the speaker, yet it seems to me that section at six, seven and a half, or eight months would certainly seem an indication to be questioned.

The indications for eclampsia do not concern us here, because in the eclamptic, preeclamptic and nephritic toxemias our treatment is different. In our clinics we do not handle our progressively increasing toxemias by cesarean section or by any other operative method, certainly not the nephritic toxemias, so readily and so quickly as it seems is done in Chicago.

The development of the operation in the lower field, however, is a great contribution to obstetrics, and we owe much to Dr. Greenhill and Dr. DeLee for the development of the technic, and for showing us the great value of the lower segment operation as compared to the other. In the series of cases that we analyzed you will remember that the lower segment operation stood up very well. In the cases in which it was done the group was an entirely different one from that which the doctor has presented here. In his entire clinic the operation was one of choice. In the cases that we analyzed it was done only in the most serious cases and the morbidity and the mortality were better than in the classical section.

DR. THURSTON S. WELTON.—This operation was in reality made popular by Dr. Beck of this city. There is a tendency throughout the country to give it a high-sounding technical name and to forget that Dr. Beck had anything to do with it. He never claimed he originated the low section operation, made it up, or changed it, or anything else. Up to 1918 fully half of the cesarean sections were the old type of section. Dr. Beck put life into this low section operation and made it popular in Brooklyn, where it is now widely employed.

DR. GREENHILL (closing).—First, the question as to what objection I personally have to spinal anesthesia. I believe that direct novocaine infiltration is safer, and it is for that reason we prefer it. The results are as good.

The analysis that Dr. Gordon and his committee made was an excellent piece of

work and much more difficult than mine. Our incidence of 1-33 as against 1-140 is correct.

Then, of course, our attitude is that we prefer cesarean section to high foreeps, especially in patients in whom we look forward to difficult deliveries. Many others would not. Our reasons are these: a clean hospital, so that we are not afraid; plus the technic, which we think is good; and our results, which seem to show that we are doing fairly good work, and we do more perhaps than the average individual in other hospitals.

Dr. Gordon mentioned the patient who was six or seven months pregnant; I agree with him. I did not like to say cesarean there at the sixth or seventh month of pregnancy. It is nothing but a hysterotomy. That was a case of psychosis where the neurologist said, "Terminate the pregnancy," and it was done. The two other cases I do not know about. I think they were toxemias. In Brooklyn and elsewhere the treatment of toxemia is conservative. Paradoxical as it may seem, I agree with that. Three years ago I read a paper wherein I reported our cases of eclampsia, 78 in all, and 75 per cent of them were delivered by section or other methods. Our total maternal mortality, not excluding anything, was 7.7 per cent. That is as good as any one has reported in this country under any form of treatment, as far as I am aware. Eighteen and one-half per cent of our patients had cesarean section. The others were delivered through the vagina by the means safest for the mother—rupture of the membranes, bag to start labor, pack, etc. The convalescence was satisfactory in 80 per cent of the cases after the babies were delivered.

In our hospital we empty the uterus for toxemia. I believe, however, for the general practitioner in the home or in a hospital that is not clean, or if he has not enough obstetric skill, the best thing to do is to leave the patient alone; give her some morphine or magnesium sulphate and nothing else. I think that if most mothers treated at home were put on a mattress on the floor the results would be better than by any other method.

Dr. Beck deserves great credit for what he did.

CENTRAL ASSOCIATION OF OBSTETRICIANS AND GYNECOLOGISTS

Inaugural Meeting, St. Louis, Mo., October 20, 1929

Dr. RICHARD PADDOCK, ST. LOUIS, presented a paper on **Clinical Follow-up in Placental Syphilis.**

The study was undertaken to check the accuracy of the histologic diagnosis of syphilis of the placenta. Group I includes 64 cases where a definite diagnosis could be made, while Group II comprises 72 doubtful cases.

The maternal blood Wassermann reaction showed the following correlations:

Group I, positive 48	Group II, positive 37
negative 16	negative 31
64	no record 4
	72

THE CHILDREN OF MOTHERS IN GROUP I

With maternal blood Wassermann positive		Maternal blood Wassermann negative	
Premature, stillborn	23	Premature, stillborn	5
Miscarriages	13	Miscarriages	6
Premature, alive (4 died later)	6	Abortions	2
Full term, alive (1 died, 4 mo.)	6	Live-born (1 died later)	3
	48		16

THE CHILDREN OF MOTHERS IN GROUP II

<i>Maternal Wassermann positive</i>		<i>Maternal Wassermann negative</i>	
Premature, stillborn	13	Premature, stillborn	14
Miscarriages	1	Miscarriages	8
Abortion	1	Abortion	1
Premature, alive	5	Premature, alive	2
Full term, alive (3 showed clinical syphilis later)	17	Full term, alive	6
	<u>37</u>		<u>31</u>

Of the four mothers in Group II with no recorded Wassermann reaction, 2 had miscarriages, and 2 delivered full-term, living children.

These data indicate that a definite diagnosis of placental syphilis is usually associated with a marked fetal involvement. When the lesion is not so well defined, marked fetal changes are less common.

When the placenta shows evidence of syphilis, the mother and child should be followed up to determine the advisability of instituting antisyphilitic treatment.

DISCUSSION

DR. C. E. GALLOWAY.—Doctor Paddock found only a small number of positive Wassermann reactions (85) out of his total cases showing syphilitic placentas (136). Up to now my practice has been to obtain a blood Wassermann reaction on every patient and to institute treatment at once if it is positive, believing that early treatment is most desirable. In view of the high incidence of syphilitic placentas among patients with miscarriages, it might be advisable to give antisyphilitic treatment to those with a history of previous miscarriage even though there is no serologic evidence of the disease at the time.

DR. F. H. FALLS.—It should be emphasized that a patient may have syphilis and still have a negative Wassermann reaction, a fact which is brought out in Doctor Paddock's figures. When examination of the placenta first draws attention to the disease, both the mother and the child should be given antisyphilitic treatment in adequate courses. In my own Department, such cases are referred to the Visiting Nurse, who sees to it that they return for treatment.

It is not easy to diagnose syphilis from the gross placentas. Many times the placenta which looks syphilitic to the eye, is shown to be negative microscopically, and vice versa.

DR. PADDOCK (closing).—Each placenta is cut in thin slices and examined grossly, typical areas being taken for histologic study. The hematoxylin eosin stain is commonly employed. In certain instances silver stains have been used, but I have never been able to say that I have found undoubted spirochetes.

Cases were placed in the doubtful group whenever it seemed that there might be any disagreement about the diagnosis. Obviously, there is opportunity for different interpretations of the observed variations from what is strictly normal.

The percentage of living children, discharged from the service two weeks to four months after birth, was 29.5 per cent.

DR. FRED L. ADAIR, CHICAGO, ILL., described a **Method for the Study of Fetal Positions.**

The findings corroborate the generally accepted ideas regarding fetal positions, but demonstrate that there is considerable variation in the relative location of the head, body, and extremities in fetuses in the same positions.

X-ray films of women at term or early in labor were taken and the fetal skeletons were outlined on superimposed paper. These fetal outlines were then drawn as a conglomerate picture, relationships of the fetal parts to the maternal structures being faithfully preserved. Drawings of the various fetal positions were prepared, as representative of the different types, the dominant attitude and position being graphically shown and variations being pictured. For the more common positions, the drawings were more accurate than for the more unusual positions, where fewer roentgenograms were available.

DR. HUGO EHRENFEST.—The most interesting thing is that this work demonstrates beautifully the correctness of prevailing conception as to position of the fetus in utero, which we long since developed as a result of abdominal palpation.

DR. ADAIR (closing).—The sole purpose of this work was to prove or disprove our present ideas about fetal positions. A sufficient number of the more usual positions has been studied to make it reasonably certain that these ideas are essentially correct, but more observations will be needed to establish the correctness of our conceptions regarding the more uncommon positions.

The same patient was not exposed more than once, and that should not be harmful.

DR. OTTO H. SCHWARZ, ST. LOUIS, presented a case report of Cortical Necrosis of the Kidney in Pregnancy.

This patient was a negress, aged twenty-two years, a primigravida, due on September 5, 1929. She was first seen on July 9 with a blood pressure of 132/78 and with no albumin in the urine. The blood pressure rose rapidly to 180 on July 19, and large quantities of albumin appeared in the urine together with granular casts. There was an oliguria in spite of the intravenous administration of glucose. Premature delivery occurred on July 21, after which the blood pressure remained high and the oliguria persisted. The blood nonprotein nitrogen, which was normal before delivery, rose to about 100 mg. per 100 c.c. The patient's condition became worse until the time of her death.

At autopsy the kidneys were small and contracted, with the cortex not more than 2 mm. thick and markedly necrotic so that not more than two-thirds of the cells were functioning. There was evidence of previous glomeruli damage and sclerotic changes in the vessels. Endarteritis was evident microscopically and recent thrombi were seen in many of these vessels.

Such a cortical necrosis of the kidney is extremely rare with only three cases in the American literature and only twenty in the world literature. The most-extensive discussion of this subject is that by Cruickshank, of Glasgow, who reviews the previous work of Jardine and Teacher.

The patient lived for twelve days, during which time there was a total output of only 810 c.c. of urine, which contained considerable albumin and a large amount of pus. Four days after operation the blood creatinin was 4.5 mg., but shortly before death it rose to 12.5 mg., and the urea nitrogen increased to 75 mg. There were never any convulsions, and never more than a slight edema. On the third postpartum day she was seized with a watery diarrhea, eight to ten stools each day, which persisted until death. Blood transfusions were given without beneficial effect.

Postmortem examination showed that the uterine condition was satisfactory, with no leakage through the incision. The kidney damage was very similar to that demonstrated by Doctor Schwarz, but was much more extensive. Scarcely any functioning kidney tissue was found.

DR. J. W. HARRIS.—In a study made several years ago we were impressed by the difficulty in deciding which patients with toxemia of late pregnancy had suffered permanent damage to the kidney tubules. It was surprising to find that many of our mild cases showed such permanent alterations. We came to feel that these nephritic changes probably were the result of the prolonged toxemic disturbance rather than the cause of the toxic symptoms.

DR. SCHWARZ (closing).—The liver in this patient showed no evidence of the ordinary changes due to the toxemia of pregnancy. There was a marked hepatic edema, but no peripheral necrosis.

DR. E. D. PLASS, IOWA CITY, IOWA, described the **Leucocyte Variations in Normal Obstetric Patients.**

There is a physiologic leucocytosis in the latter part of pregnancy, especially in primiparas, with a further rise of the leucocyte count during labor, when the total count may mount considerably higher depending in part upon the length of labor. Following delivery the white cells tend to increase during the first two to six hours and then fall rapidly to normal in a few days. The labor leucocytosis may be attributed to muscle exertion, but no adequate explanation of the postpartum rise has been offered, since it is not actually proportional to the severity of the labor nor to the loss of blood. The leucocytosis is polymorphonuclear in character with a relative and even an actual diminution of the lymphocytes, and mononuclears, and often a disappearance of the basophiles and eosinophiles.

Diurnal variations, sometimes occurring within a few minutes, may change the count as much as 4,000 or 5,000. Exercise seems to cause an increase, and nursing a diminution. At the time of a chill, a leucopenia with a count down to 2,000 or 3,000 may develop.

DISCUSSION

DR. L. A. CALKINS.—For the past several years we have made leucocyte counts during labor and on the third day postpartum, and have obtained counts ranging from 6,000 to 22,000 in patients who are clinically normal. On the third day after delivery, the counts are generally higher than during labor. As a rule we do not consider a count below 15,000 as indicative of any abnormality.

DR. G. D. ROYSTON.—My personal experience with leucocyte counts in pregnancy consists in cases with tuberculosis, where a shift to the left in either the Arneth or the Schilling hemogram apparently indicates activity. We have largely discarded the total leucocyte count and are depending more upon the differential count. In this latter procedure it is essential to have good stains, and we have been forced to rely upon imported products.

DR. PLASS (closing).—Modern differences in nomenclature make it difficult to interpret differential counts from various clinics, but there can be no doubt that they

are of more value than total counts. The average intern does not make counts upon which too much reliance can be placed. Little attention should be paid to minor variations in the total count since increases or decreases of several thousands may occur within a short period from physiologic causes.

DR. HENRY SCHMITZ, CHICAGO, discussed the Indications for Various Methods of Treatment in Primary Carcinoma of the Uterine Cervix.

Any choice of method of treatment in carcinoma of the cervix must be based upon the extent of the disease, and the author years ago proposed a clinical grading, which has been widely adopted, as follows:

Group 1. Beginning nodule or ulcer, not larger than 1 cm. in diameter, with normal mobility of uterus and adnexa. Treatment is surgery or radium.

Group 2. Tumor or ulcer involving one-half or all of the cervix in either the transverse or longitudinal diameter, together with a dough-like consistency of the paracervical tissues, and loss of uterine mobility, due to decreased elasticity of adjacent connective tissue. Treatment is radium and x-ray.

Group 3. Tumor or crater of cervix with (a) rigidity of paracervical tissues; (b) invasion of parametria; and (c) invasion of regional lymph nodes, the entire mass having restricted mobility. Treatment is radium and x-ray.

Group 4. Advanced lesions showing (a) involvement of parametria and regional lymph nodes with fixation; (b) involvement of bladder, vagina, or rectum; (c) distant metastases; and (d) advanced cachexia. Treatment is symptomatic or palliative.

Contraindications to surgery and radiation therapy were discussed and the end-results in 332 cervical carcinomas detailed. In Group 1, the chance for recovery is about 8 in 10; in Group 2, 4 in 10; in Group 3, 1 in 8; while in Group 4, no hope for cure should be entertained.

DISCUSSION

DR. F. J. TAUSSIG.—Since 1917, I have treated approximately 550 patients with carcinoma of the cervix, but have operated upon only 40 patients, about 8 per cent. Operative mortality will be very low (5 or 6 per cent) if only Group 1 cases are submitted to operation. Infection should be cleared up before operation, since it greatly increases the risk. Occasionally, radium is not at all effective even in early cases, and, moreover, I feel sure that sometimes it scatters the tumor more than surgery does, bone and chest metastases being more commonly noted. I believe that gold radon seeds are a useful adjunct which has not been mentioned.

In advanced cases, the use of blood transfusions helps greatly to reduce the toxemia. Occasionally, colostomy reduces the toxemia by eliminating the block of the rectum, and, moreover, may serve to relieve pain and pressure.

DR. H. S. CROSSEN.—I believe that patients in Group 1 should be given the benefit of surgery in addition to radiation, because of the uncertainty as to the extent of the cancer-killing effect of radiation in the individual patient. This effect varies greatly in different patients, and occasionally falls far short of what is reasonably expected. We know that operation in these early cases will remove all presumably involved tissue, but we do not know that radium will kill all cancer cells in that removable tissue in that particular individual. It is to be hoped that advances in radium treatment will some time give us that certainty. Until then I prefer to employ operation in addition to radiation.

DR. EMIL REIS.—The operation for carcinoma of the cervix which I proposed in 1895 was designed to include a radical dissection of the pelvis similar to the dissection of the axilla for cancer of the breast. Wertheim followed this plan in his first ten cases, but the mortality was so serious that he receded from this radicalism. What is now called the Wertheim operation is not radical; in fact, its very first steps make it impossible to make a radical dissection, as they violate the principle of block dissection.

I have patients living without recurrence for twenty years, but I cannot present complete statistics of my results, because my patients are widely scattered and I cannot obtain follow-up reports. Even five-year end-results do not mean much; for example, the very first patient I operated upon in 1896, came back in 1905 with extensive carcinoma of the external inguinal glands, which I removed successfully.

The carcinoma operation, as I intended it, is a difficult and laborious piece of work, and I am not anxious that everybody should take it up. I hope that radium will relieve us of the need for these severe operations.

DR. SCHMITZ (closing).—If radiation therapy is employed on all cases, even in those of Group 1, we will reduce the mortality and morbidity inherent in surgical treatment and will definitely increase the number of five-year, good end-results. Since 1917 we have treated all our cases with radium and the results have been excellent. Statistics may prove anything, but they do give relatively reliable information of what can be done and therefore cannot be discarded.

Much is yet to be learned about x-ray and radium therapy, and as progress in technic is made we may expect even better end-results.

DR. GEORGE GELLHORN, ST. LOUIS, discussed Local Anesthesia in Labor.

Various popular methods of anesthesia in labor carry certain dangers for the child and for the mother. I believe that *hypalgesia* is all that is needed in the first stage, and that only the second stage requires *anesthesia*. This may be accomplished by light twilight sleep combined with local anesthesia, as follows:

1. When strong contractions occur every five minutes or oftener and the os admits at least two fingers, morphine ($\frac{1}{6}$ grain) and hyoscin (1 c.c. = $\frac{1}{130}$ grains) are given.

2. One to one and a half hours later, depending upon the degree of somnolence, $\frac{1}{2}$ c.c. of hyoscin is given.

3. This light twilight sleep lasts, as a rule, through the first stage and well into the second. When it proves insufficient, a little gas may be given with contractions, but this is discontinued when the head becomes visible.

4. At this stage, the perineal skin, the lower circumference of the vulva, the perineal body, and the levator muscles are infiltrated with $\frac{1}{2}$ per cent novocaine solution, with 3 drops of adrenalin to the ounce. Two or three ounces are needed.

5. The levators relax immediately and the introitus is seen to gape. Delivery, whether spontaneous or by forceps, is painless, and episiotomies can be made and, later, repaired painlessly and bloodlessly.

6. Patients may complain of a dull ache in the back. Of the two component pains of parturition, viz., pressure on the sacral plexus and stretching of the pelvic floor, the latter and more severe is eliminated by local anesthesia.

7. Uterine contractions usually decrease in force as soon as the local anesthesia becomes effective, i.e., about five minutes after infiltration, but may be stirred up again by a few drops of pituitrin if the progress of labor is retarded.

8. Perineal tears are infrequent owing to the marked relaxation of the vaginal outlet. Moreover, episiotomies are made rather freely.

9. The child is not affected by the small amounts of morphine and hyosein.

10. The third stage shows no alteration.

11. The technic is simple and can be carried out in the hospital or in the home. In the latter it obviates the need for an anesthetist.

12. In complicating disease, contraindicating inhalation anesthesia, the method has particular advantages.

DISCUSSION

DR. RUDOLPH HOLMES.—I have never used nerve block or spinal anesthesia because I have always been afraid of them, while the trouble with ethylene and ether is that they are explosive. My early experience with morphine and scopolamine was very discouraging because of the bad effects on the babies. If these drugs are given early in labor they may be of value, but when given late they may be disastrous to the child, and therefore I have always been against twilight sleep and its modifications.

DR. J. P. GREENHILL.—Personally, I have not used morphine during labor for a number of years. Magnesium sulphate is used for analgesia and spinal anesthesia for abnormal labor. Local anesthesia is employed for cesarean sections and for episiotomies.

DR. CARL H. DAVIS.—My idea of handling the first stage is identical with that described by Dr. Gellhorn, except that I prefer heroin to morphine. I have not used local anesthesia during the second stage because I have always been fearful that it might predispose to infection. I am opposed to the use of infiltration anesthesia in vaginal plastic surgery. Recently we have abandoned the use of ethylene for fear of an explosion, and have gone back to nitrous oxide-oxygen for second stage analgesia and anesthesia.

DR. GELFHORN (closing).—Individualization of the patient is necessary in choosing the proper anesthetic. I have used nitrous oxide-oxygen in many cases successfully, but its use requires a trained anesthetist. Local anesthesia gives very considerable relief and may be given without assistance. I am not sure it is wise to eliminate by artificial means all memory of the highest function that women can fulfill.

The method which has been proposed is simple, and will relieve our patients of needless pain during labor.

DR. Q. U. NEWELL, ST. LOUIS, demonstrated A New Instrument for Abdominal Tubal Insufflation, which has proved very satisfactory.

DR. E. L. CORNELL, CHICAGO, demonstrated A Mechanical Cross-Index of Summary Cards in Obstetrics and Gynecology for use in private offices as well as in hospital record rooms.

DR. A. HARTMANN, ST. LOUIS, discussed the use of **A New Combined Solution for Combating Either Acidosis or Alkalosis in Children.**

DR. G. LIESE AND DR. E. S. AUER, ST. LOUIS, discussed **The Diagnostic Test of Early Pregnancy from Urine**, and presented fresh experimental animals demonstrating the appearance of the blood spots in the ovary, which constitute the positive sign of pregnancy.

DR. W. J. DIECKMANN, ST. LOUIS, discussed **A Case of Lipoid Nephritis in Pregnancy.**

A sixteen-year-old white girl was admitted on Nov. 22, 1929, when twenty-two weeks pregnant, because of severe edema of three weeks' duration. There was a general anasarca, the blood pressure was 160/115 to 200/150, the basal metabolic rate was minus 13.5 per cent. The urine, which contained 1.0 per cent of albumin, showed numerous hyaline and granular casts together with many doubly refractile lipid bodies. There was a moderate anemia. Blood chemistry revealed total N.P.N, 47 mg. per cent (became normal in forty-eight hours); total serum proteins, 4.6 per cent; cholesterol, 350 mg. per cent, and total lipoids, 2018 mg. per cent. There was slight edema of both retinas. Microscopic examination of the capillaries revealed moderate dilatation of the venules, some beading, and definite slowing of the flow.

The patient miscarried the day after admission. Novasurrol and thyroid extract (up to 4.8 gm. per day) did not relieve the edema, which finally responded to a salt-free, fat-poor diet containing 50 gm. of protein. As the edema decreased, the protein was increased to 100 gm. per day, to balance a loss through the urine of 12 to 22 gm. per day (the urine at one time contained 5.9 per cent albumin). The patient lost weight from 54.5 kg. to 39.8 kg. On discharge the blood pressure was 140/110.

DR. PERCY SWAHLEN, ST. LOUIS, showed a case of **Unusual Pelvic Deformity Producing Dystocia.**

The patient, aged thirty-five years, had had one spontaneous delivery six years previously. Three months later, pain developed in both hips, and shortly afterward the legs became $1\frac{1}{2}$ inches shorter. There was no history of rheumatism or of injury to the extremities, except that she had been struck on the right knee when six years old. When first seen, pelvic examination was difficult because of inability to separate the knees for more than a few inches. X-ray examination showed marked arthritic deformities of both hip joints, with large exostoses projecting from the upper margins of the acetabulum over the heads of the femora and markedly limiting abduction.

Vaginal delivery seemed impossible, and cesarean section was performed, both mother and child surviving.

X-ray films were shown and the patient was presented.

DR. PALMER FINDLEY, OMAHA, presented a specimen of **Inversion of the Uterus.**

The specimen showed complete inversion of an early puerperal uterus.

It was emphasized that it is important first to control bleeding, then to combat

shock, and finally to correct the inversion. Hemorrhage is the most frequent cause of death in such patients, although sepsis accounts for fully one-third of all fatalities.

In the absence of marked hemorrhage and profound shock, and under good aseptic conditions, early replacement, which is usually easy, is the method of choice. Where vaginal replacement has failed, and in the presence of probable sepsis, vaginal hysterectomy gives very excellent results.

DR. F. EMMERT, ST. LOUIS, discussed a case of **Twin Lithopedion in Tubal Pregnancy**, and presented the specimen. This is probably the only case on record.

The patient, aged fifty years, presented a hard tumor mass, which filled the entire true pelvis and bulged into the rectum. For twenty years there had been more or less bearing down, with steadily increasing pressure on the bladder and rectum. At laparotomy, the mass was adherent to the anterior abdominal wall, to the fundus of the uterus, and to the great omentum. This mass contained long bones of the extremities, ribs, and cranial bones, which had partially discharged into the upper part of the fundus, so that several bones were imbedded deeply in the uterine wall, lying free in the culdesac, the second mass, the size of an orange, was surrounded by a dense layer of calcium. Both ovaries were normal. The left tube had a normal abdominal opening, but the ostium of the right tube could not be found.

X-ray plates of the masses showed evidence of two fetuses, the larger one from the culdesac representing a fully formed fetus, while the smaller from the fundus showed an irregularly shaped mass of bones, remnants of a second fetus. Connected with the smaller portion, there was an irregular area of calcification resembling calcified membranes rather than actual bone formation.

DR. F. P. McNALLEY, ST. LOUIS, described **A Case of Very Early Carcinoma of the Cervix**, and presented the histologic sections.

The patient, a colored woman aged thirty-one years, was four months pregnant when first seen, and had had a bloody vaginal discharge for the preceding six weeks. The cervix was lacerated and presented a suspicious area, from which a piece of tissue was taken for diagnosis. Only one section showed anything suggestive of cancer and opinion was divided as to the diagnosis. On October 10, when twenty-six weeks pregnant, the patient miscarried. At that time there was absolutely no change in the appearance of the cervix. On November 7, tissue removed definitely showed carcinoma.

This is the earliest carcinoma he had ever seen.

DR. C. F. MOON, OMAHA, described **A Case of Breus' Mole**, and presented the specimen.

DR. R. H. LUIKART, OMAHA, described **A Case of Hydatidiform Mole**, and presented the specimen.

DR. R. J. CROSSEN, ST. LOUIS, described **A Case of Gumma of the Cervix**, and presented the microscopie slides showing the lesion.

The patient, aged thirty-four years, had had a seven months' miscarriage, followed by a full-term stillbirth, and gave a history positive for syphilis which had been treated for two years to a negative blood Wassermann reaction. She was first seen about the middle of October, when the cervix showed an erosion extending 1.5 cm. from the external os, which bled freely on manipulation, but did not look like a carcinoma. Two weeks' treatment with mercury and arsphenamine produced no change in the appearance of the lesion. Biopsy was finally done and the sections showed an undoubted gumma of the cervix, a lesion which is easily confused with carcinoma or tuberculosis.

DR. S. A. WEINTRAUB, ST. LOUIS, described **A Case of Combined Extra-uterine and Uterine Pregnancy**, with a live mother and two living children.

The patient, a colored woman, aged thirty-eight years, had previously had two full-term children but no miscarriages. The date of the last period was indefinite. On Dec. 26, 1928, there was a sudden attack of severe pain in the left lower abdomen, which confined her to bed for several days, during which there was slight vaginal bleeding. Progressive enlargement of the abdomen had been noted, but the patient did not suspect that she was pregnant.

On examination, May 31, 1929, a diagnosis of twin pregnancy was made, with one child in cephalic and the other in transverse presentation. The blood pressure, urine, and blood were normal.

On June 7, 1929, the patient delivered spontaneously a premature child weighing 2200 gm. There was no tendency toward expulsion of the other fetus, and careful examination led to a diagnosis of an extrauterine, living fetus. This second child which weighed 1420 gm. was delivered by laparotomy. Severe bleeding precluded the possibility of removing the placenta, which was widely adherent, so the area was carefully packed and the abdomen closed. The placenta was expelled through the abdominal sinus on July 3.

When last seen on Nov. 6, 1929, the mother and both children were apparently well and normal except for certain deformities of the extrauterine child, resulting from the oligohydramnios.

DR. L. A. CALKINS, KANSAS CITY, discussed **An Interesting Combination of Ovarian Cyst and Pelvic Inflammatory Disease**.

The patient, a colored woman, aged thirty-eight years, complained of pain in the lower abdomen, more marked on the left, heaviness in the pelvis, and an inconstant leucorrhœa. She had had two children, who were living and well, but no miscarriages.

Examination showed a firm, cystic (?) mass filling the right pelvis and extending far over to the right and up to the umbilicus. The cervix was high up and to the left, while the uterus could not be located. There was a hard, tender ledge around the rectum constricting its caliber considerably, but not involving the mucosa. Hemoglobin 51 per cent, R.B.C. 3,640,000, W.B.C. 9,300. Sedimentation 29 mm. in one hour. The urine showed a trace of albumin.

The large mass could be an ovarian cyst or a uterine fibroid, or possibly a solid tumor of the ovary. The perirectal induration could be inflammatory or malignant.

Laparotomy, which was done after a week of bed rest with normal temperature, revealed a large multilocular cyst of the right ovary with bilateral salpingitis. The cyst was removed with some difficulty, after which the tubes were excised without any apparent injury to the bowel. The patient promptly developed typical colon-bacillus peritonitis, and died in less than twenty-four hours.

Autopsy revealed, in addition to the general peritonitis, other evidences of acute infection in the heart, spleen, kidneys, and other organs. The operation specimen showed both acute and chronic salpingitis with a small tuboovarian abscess.

Closer attention should have been paid to the preoperative findings, especially the blood sedimentation rate, and operation should have been confined to removal of the cyst.

DR. E. LEE DORSETT, ST. LOUIS, presented A Brief Analysis of the Treatment of 186 Cases of Eclampsia by Intramuscular Injections of Magnesium Sulphate.

In 1923 we began the intramuscular injections of magnesium sulphate for the control of eclamptic convulsions and to date have treated 186 cases in this manner with a maternal mortality of only 7 per cent. We have found recently that by decreasing the amount of the drug given at each injection and by giving 500 to 1000 c.c. of 20 per cent dextrose intravenously, we have improved our results. This treatment serves to increase urinary output quite promptly.

In this series we did only 9 cesarean sections, since I feel that this procedure is indicated in only a very few patients.

Our patients are first treated as purely medical cases, and when we have the eclampsia well under control, labor is induced, generally by means of a bag. Those who do not respond to conservative treatment are delivered by cesarean section. The routine treatment is as follows:

1. Ten c.c. of 20 per cent magnesium sulphate solution intramuscularly, deep into the gluteal region. Repeat injections every one or two hours if convulsions continue.
2. Colonic irrigations.
3. Gastric lavage until the wash water returns clear. Then introduce into the stomach 60 c.c. of concentrated magnesium sulphate solution (for purgative effect).
4. Five hundred to 1000 c.c. of 20 per cent dextrose solution intravenously every twelve to twenty-four hours, as conditions indicate.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D., CHICAGO, ILL.

Symposium on Maternal and Fetal Mortality*

AMERICAN PUBLIC HEALTH ASSOCIATION

MEETING AT MINNEAPOLIS, MINN., OCTOBER, 1929

Antenatal, Intranatal, Postnatal Conditions in the United States, John Osborn Polak, M.D., Brooklyn, N. Y.

Childbearing in the United States today is a hazardous adventure, the many dangers of which the public does not seem to appreciate. Although the ordeal is still considered a physiologic process it takes place in an individual who is different from the primitive woman who lived out in the open, was fed on fruits, vegetables, milk and fish, developed her muscles by physical labor and was protected from infections by religious customs and rites; the civilized woman eats and drinks what she pleases, often lacks outdoor exercise and is subject to many diseases. Therefore, she often presents herself as an impaired risk because of developmental defects, sequelae of dietary errors, lack of physical exercise and because of stigmas of certain previous or existing diseases. Then she may be attended by a supposedly skilled physician whose poor judgment may tempt him to so modify labor and delivery as to create pathologic conditions; or she may have an unskilled attendant whose ignorance of asepsis, cross infections, and application of instruments puts her life and that of the baby in great danger.

Spontaneous normal deliveries, statistics show, will occur in 90 to 95 per cent. Uncontaminated spontaneous labors are afebrile. Repeated vaginal examinations, instrumentation, and manipulation all mean contamination.

Maternal mortality in the United States from all puerperal causes is generally stated to have shown no improvement in the last twenty years because the good work of the trained and skilled attendant, who practices aseptic conservatism, is counterbalanced by the poor work of the unskilled.

Direct causes of maternal mortality and morbidity are headed by infections, toxemias, hemorrhage, obstetric accidents and operative deliveries. There were 6.7 deaths per 1,000 mothers in the birth registration area of the United States between the years of 1915 to 1927. Puerperal sepsis alone took a toll of 2.5 deaths per 1,000 mothers, or 30 to 43 per cent. Toxemias caused 26 per cent of all maternal deaths. These are preventable to some extent as has been demonstrated in large maternity clinics and in the several out-patient teaching services throughout the country where a simple aseptic surgical technic has been adopted and interference with labor reduced to a minimum.

Predisposing causes of maternal mortality and morbidity are lack of proper prenatal, intranatal, and postnatal care and education of the patient; her social status, environment, color, age, and inherent resistance to infection. This results in failure to diminish fatalities due to toxemias and antepartum hemorrhage and unrecognized

*Abstracts prepared by Manuel Spiegel, M.D., of Chicago, Ill.

malpositions and disproportions, monstrosities and syphilis. It increases operative interference with labor by an unskilled and untrained attendant, causing trauma, hemorrhage and infection. The operative incidence in teaching hospitals is very low: in a study of over 8,000 of Dr. Polak's records, it is found that the incidence per 1,000 is—forceps 23 to 34, version 8 to 20, cesarean section 8 to 15. The deaths of mothers under twenty years of age is higher than from twenty to twenty-five years, because, probably, of the large number of illegitimate pregnancies that occur in this class which are interrupted with lack of aseptic care. The maternal mortality rate is higher in the colored race than in the white as shown by comparison of all puerperal deaths in 1927 in several states of the north with those in the south where the ratio of colored population is larger: Minnesota, North Dakota, and Wisconsin range from 4.4 to 5.3 per 1,000; Mississippi, Louisiana, and Florida range from 8.7 to 11 per 1,000. It is also interesting to note that the incidence of puerperal sepsis is greater among those who do not have a history of a previous streptococcic infection, the ratio being about 10.1.

Fetal mortality and morbidity depend, to a large extent, upon the same causes as those of the mother and may be outlined as those due to placental disease, dystocia and character of labor, and the type of operative delivery. Placental disease can be reduced tremendously by watchful care of the mother by her physician to check intercurrent infections and toxemias, to treat syphilis during pregnancy and to induce premature delivery in a woman presenting a history of habitual premature separation of the placenta. Dystocia due to malpositions and disproportions is a rarity. The reports of abnormal presentations for the following hospitals during 1928 are: Rotunda Hospital, in 3,779 deliveries, 3,534 were vertex presentations and 245 were abnormal presentations; Long Island College Hospital and Methodist Episcopal Hospital each report about 322 abnormal presentations in 7,000 consecutive cases. In these hospitals, therefore, reporting a total of about 18,000 cases, 95 per cent were vertex presentations and 92 per cent terminated by spontaneous delivery. The incidence of stillbirths, including all babies dead in utero before and during delivery averages about 28 per cent in the following hospitals as compared with 7.5 per cent in hospitals of the country at large:

<i>Hospital</i>	<i>Deliveries</i>	<i>Per Cent Stillbirths</i>
Rotunda Hospital	3,779	2.9
Greenpoint Hospital (Brooklyn)	2,016	3.2
Long Island College Hosp. (Brooklyn)	3,000	2.7
Chicago Lying-In Hospital	21,000	2.4
Jewish Hospital (Brooklyn)	2,229	3.1

In conclusion, it is evident that better work in obstetrics in the United States at large can be done.

Effect of Antepartum Care of the Mother, Blanche M. Haines, M.D.,
Washington, D. C.

Infant mortality due to:

Gastrointestinal diseases	13	per	10,000	live	births	in	1922
	8	"	"	"	"	"	1927
Respiratory diseases	14	"	"	"	"	"	1922
	10	"	"	"	"	"	1927
Natal and prenatal causes	36	"	"	"	"	"	1922
	34	"	"	"	"	"	1927

Maternal mortality due to:

Albuminuria and convulsions	18	"	"	"	"	"	1922
	15	"	"	"	"	"	1927
Puerperal septicemia	23.7	"	"	"	"	"	1922
	23.9	"	"	"	"	"	1927

(Abortions were responsible for 45 per cent of deaths from septicemia. About nine-tenths of cases in the sepsis group had inadequate or no prenatal care.)

Antepartum care of the mother, therefore, has reduced infant mortality, due to natal and prenatal causes, and maternal mortality, chiefly, from albuminuria and convulsions.

The Effect of Prenatal Care Upon the Infant, Clifford G. Grulee, M.D., Chicago, Ill.

Effect of prenatal care upon the infant is obvious. The treatment of syphilis during a pregnancy gives the best evidence as to the value of prenatal care for the infant. Acute infections of the mother, eclampsia, trauma, and induction of labor are conditions in which at least we may hope to get better results. But in the present state of our knowledge we have practically no control over the infant mortality and morbidity due to congenital debility or malformation.

Causes of congenital debility are:

1. "Unknown causes"	60 per cent	} 75 per cent unknown causes
2. Twins and triplets account for	15 per cent	
3. Disease of the mother (Due to tuberculosis, anemia, nephritis, and heart disease)	8 per cent	
4. Habitual premature labor (Due to placenta previa and syphilis)	4 per cent	

Maternal and Infant Mortality in Boston, C. F. Wilinsky, M.D., Boston, Mass.

In a study of 984 maternal deaths by Dr. Coffin of Massachusetts, 58 per cent were attributed to toxemias, sepsis, and hemorrhage, all avoidable causes, as about 89 per cent of this series had not received adequate prenatal care.

Infant mortality reduction, however, has been quite noticeable since out of every 1,000 born twenty-five years ago, 30 more infants died before the age of one, than today. That is, infant mortality rates of 100 were very prevalent while today they are less than 70. A study of the most prevalent causes of death, under one year, emphasizes a marked reduction from gastric diseases. But there has been very little reduction in deaths from prematurity, injuries at birth and congenital malformations.

Adequate training of physicians in obstetrics and pediatrics will strongly influence the reduction of deaths of mothers from toxemia and sepsis and of infants from prematurity and injuries at birth.

Maternal and Infant Care in a Public Health Program, J. H. Mason Knox, Jr., M.D., Ph.D., Minneapolis, Minn.

A successful public health program provides adequately for maternal and early infant care. It emphasizes the importance of prenatal care to the public, especially to the expectant mother, by lectures and literature. In many states public health nurses are sent to them and give them some advice and help them make necessary arrangements for delivery. In the large cities and even in some small districts it provides prenatal clinics.

Natal care responsibilities of the health department chiefly consists in the prompt registration of births and the keeping of records of maternal and infant deaths and their causes. The regulation of the practice of midwives, also, is usually under the jurisdiction of this department.

Postnatal care is carried out by visiting nurses, and letters are sent each month to the mothers which inform them in a general way about their care and that of the babies. The health department is also interested in the proper feeding of the baby and its hygiene which it carries out through infant welfare stations, lectures, and letters.

The Effect of Postnatal Care on the Infant, Frederic W. Schultz, M.D., Minneapolis, Minn.

Infant mortality has been reduced in every part of the civilized world during the last decade. This reduction has affected every age group except the first month of the infant's life, particularly, the first two weeks; in this group the mortality figures have remained almost as high as ever.

The chief causes of postnatal mortality are: (1) Congenital anatomical defects, (2) prematurity, (3) birth injuries, (4) infections, and (5) poor thermal control. Of these, prematurity and infections have the largest death toll.

Congenital anatomical defects, fortunately, furnish the smallest part of the infant mortality at this age. They are amenable to treatment only in exceptional instances.

Prematurity causes fewer deaths of infants because of the advanced knowledge of care and infant feeding.

Birth injuries can be lessened largely by better obstetric care during delivery. However, it has been shown by Adair and others that injuries resulting in hemorrhage can occur in supposedly easy short labors.

Infections involving the respiratory tract and the lymphatic structures of the throat are the most common. These rapidly become serious because of the limited defensive immunologic action of the infant at this age. This can be prevented largely by avoiding contacts with anyone having the slightest cold and by the proper care of the infant as soon as it should contract an upper respiratory infection.

Thermal control, particularly in a premature infant, is inadequate. The mechanism lacks the capacity to quickly adjust itself to fluctuations in external temperatures and sudden collapse and heart or respiratory failure can and frequently do occur. With simple mechanical devices the proper thermal conditions can be maintained for the premature infant and its body temperature safeguarded.

The Effect of Postpartum Care on the Mother, Jennings C. Litzenberg, M.D., Minneapolis, Minn.

perium, or that time during which she is in bed. Anemia and nervous exhaustion are not infrequent causes of delay in restoration of the mother to health. Infections, especially cystitis and pyelitis, which are the commonest complications, should be looked for not only by evident symptoms, but by routine physical and laboratory examination. And before the patient is discharged from the hospital she should be examined, any abnormalities found should be corrected or treated, and she should be instructed to return for a check-up examination at the end of the intermediate puerperium which is on the average about six to eight weeks during which time the mother is informed what she should do and what she should not do. Patients who recover from toxemias of pregnancy are carefully reexamined and treatment continued until the health is restored. Acquired displacements of the uterus which early were treated with special exercises, such as knee-chest position or the kangaroo walk in cases of retrodisplacements, should now be corrected and kept in normal position with an accurately fitted pessary. Dr. Litzenberg states that in his experience cases are cured in 90 per cent of retroversions when a pessary is fitted soon after delivery, while if introduced at a later time the failures are at least 90 per cent. Cervicitis is another condition that should be cared for at this time and treatment continued during the remote puerperium which extends indefinitely until the effects of childbirth are healed. Since it is known that between 80 to 90 per cent of infected torn cervixes and erosions can be cured and that these conditions are to be considered precancerous, it ought not to be difficult to appreciate the importance of postpartum care.

Effect of Intrapartum Care on the Mother, J. P. Greenhill, M.D., Chicago, Ill.

Analysis of the results at the Chicago Lying-in Hospital show that there is occasion for increased maternal mortality and morbidity because of the higher incidence of operative deliveries in this hospital than in general obstetric practice. However, in the 23,136 deliveries in the past nine years, there were 57 deaths, or only 24.6 per 10,000. Of these there were three deaths from septicaemia, but only one resulted from an infection which developed in the hospital.

Maternal morbidity at the Chicago Lying-in Hospital is likewise very low, even though the strictest standard is adopted; namely, that every elevation of temperature up to 100° F., or above, even if recorded only once from the moment of delivery until the patient is discharged from the hospital. Under this standard, the total morbidity among the 23,136 patients was 10.8 per cent. However, a fair proportion of this morbidity was due to extragenital causes.

Management of labor at the Chicago Lying-in Hospital is essentially the same as in any large teaching or special maternity hospital.

The Effect of Intranatal Care Upon the Infant, Walter R. Ramsey, M.D., Minneapolis, Minn.

The mode of delivery is essentially related to childbirth injuries. In spontaneous deliveries the incidence of injuries of the baby is very small as is expected. Ramsey believes that in Europe, particularly in the Scandinavian countries, where fully 85 per cent of the children are delivered by well-trained midwives, the infant mortality and morbidity is much less than in this country where almost the same percentage of cases are cared for by physicians.

Obstetric interference during labor is accompanied with a large number of injuries to the infant. Injuries about the face and head as a result of forceps, paralysis of arms from injured brachial plexus, fractured femurs from traction,

are often seen; many of these are transient, but not infrequently some of these injuries are carried through life.

Unnecessary interference is responsible for a good percentage of these cases and this can be much reduced.

The Status of Maternal and Infant Mortality, Julius Levy, M.D., Newark, New Jersey.

Maternal mortality in Newark with special reference to deaths in early periods of pregnancy, particularly due to abortions, has been carefully followed up by Julius Levy during the years 1924, 1927, and 1928. In his report are considered 232 puerperal deaths of which the period of gestation could not be traced (as this information is not included in the death certificates) in 20.

In the third trimester of pregnancy, maternal mortality has decreased since 1924, but it is still high in comparison with other countries. About 18.4 per cent of maternal deaths occurred in the first trimester; and 30.2 per cent in the first and second trimesters, of which 60 per cent were due to abortions.

Abortions cause 20 per cent of the maternal mortality.

American Journal of Obstetrics and Gynecology

GEORGE W. KOSMAK, M.D., EDITOR

HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Editorial Comments

The Prevention of Congenital Syphilis

THE aims and purposes of the recently inaugurated White House Conference on Child Health and Protection have been lucidly placed before the readers of the Journal in the March issue of this year. In this scheme of conservation of the nation's most valuable assets—its children—problems of the utmost importance will, for the first time in the history of our country, be attacked in a thoroughly systematic, scientific and nation-wide manner. Such an organization will give a new impetus to already existing but scattered movements of reform. Among the many problems that will come up for consideration will be that of the prevention of congenital syphilis, in which every practitioner of obstetrics may in time be asked to lend a helping hand.

To congenital syphilitics, life is, indeed, a valley of tears. The only piece of good luck that may possibly happen to them, is in case they arrive on the scene in a macerated condition or if they are stillborn. If delivered alive, their troubles begin. If premature, as is so often the case, these puny creatures with their wrinkled skins and the faces of sad old men, fortunately perish in a short time. If they are born at term, they may be covered with eruptions or present fissures about the lips or the anus that do not heal. There are others who are seemingly normal at birth, but develop "snuffles" later, with consequent respiratory embarrassment. And all this variegated misery is suffered in vain; for even if, with careful medical and nursing attention, the child has been pulled through for the moment, death from some trivial cause claims about 50 per cent within the first year. Considering this belated and the immediate mortality, it is no wonder that Osler called congenital syphilis "one of the six best killers."

'Tis a pity that not all congenitally syphilitic children die in early life, for the ultimate fate of those who survive is far from enviable. Physically and mentally, they drag a ball and chain through their entire existence. There are the keratitis and other eye lesions, oto-

sclerosis and Hutchinson's teeth, saber-tibia and scaphoid scapula, various cutaneous and mucous membrane affections, juvenile tabes and paresis, and a host of other manifestations. Mentally, too, they bear the stamp of inferiority, and their inherited taint may turn them into morons and imbeciles or produce in them a low moral fiber which leads such congenital syphilitics so often into conflicts with the law. These, to be sure, are extreme cases; but even if such manifest sequels are absent, the congenital syphilitic is never quite normal. He does not play as other children do, he is called "queer" in school, and he acts queerly all through adult life. He is at odds with himself and the world in general—a square peg in a round hole. And he may beget children who, likewise, are afflicted with physical or mental inferiority or even with actual syphilis, for instances of syphilis in the third generation are by no means rare.

Of course, much can be done by proper treatment, but such treatment must be very extensive and prolonged, and for this necessity the majority of syphilitic parents have neither intelligent understanding nor sufficient means.

Welander, of Stockholm, who first recognized the need for extended and institutional treatment and took such children into his own house, affords us a beautiful example of true humanitarianism, and several such "Welander Homes" were created in the Nordic countries as well as in Germany and France. The available reports contain some remarkable successes, but after all the net result was not commensurate with the immense amount of effort expended.

One is forced, therefore, to conclude that the best treatment of congenital syphilitics consists of *preventing* them from becoming such. Theoretically, this object might be accomplished by forbidding syphilitics to marry, but we know only too well that prohibition does not prohibit. For practical purposes, therefore, our prophylactic measures cannot be set in motion in most instances until after conception has taken place. Prevention, then, will depend on timely discovery of the disease in the mother. The routine employment of the Wassermann or kindred tests in many prenatal clinics has been a great step forward and deserves unstinted praise. Unfortunately, serologic examinations have not proved wholly reliable in pregnant women, for in a certain, though small percentage, they have been negative in patients with manifest syphilis and, conversely, positive in definitely healthy individuals. In how far this eccentric behavior of the Wassermann reaction depends on the pregnant state or in possible mistakes in the laboratory, need not detain us at this moment; the fact remains.

fore, be much more searching than it is in reality. It should begin with a thorough history. The phrase so usually found in the records, "Patient denies syphilis (and gonorrhoea)," strikes one as fatuous. The woman who knows of her infection, will, as a rule, not admit it, but in most instances she is wholly ignorant of having the disease and acts in good faith when she gives a negative answer. The examiner, however, may obtain valuable clues from the history of previous abortions or stillbirths, from tactful inquiries into the health of husband or children, and from delving into the patient's personal condition past and present. The examination should embrace the entire body, and at this point we may as well admit to ourselves that in obstetric practice this is usually omitted. Yet, to the suspicious and, therefore, alert examiner, traces of a former syphilitic infection will appear somewhere on the skin or mucosae, in glands or bones, in the behavior of the reflexes or blood pressure. Now is the time to use the blood and, if necessary, the spinal fluid Wassermann test for further confirmation and to study the blood picture for any suggestive lymphocytosis.

If all this be considered too much trouble, let us remember that the welfare of the whole race depends on such thoroughness.

Once the diagnosis is established, energetic treatment should be started at once and continued throughout pregnancy, *irrespective of any previous treatment*. We do not know just how soon the mother's spirochetes invade the placenta and the fetus; hence, the earlier treatment is begun, the better are the chances of success. The fact that syphilitic abortions do not often occur before the fifth month, does not exclude the possibility that the spirochetes are lodged in the placenta long before that term. But even if a syphilitic mother should not come for examination until late in pregnancy, arsenicals and mercurials should be administered without delay, for the small amount of anti-syphilitic drugs which the child would receive in utero and, later, in the mother's milk, would give it at least a little better start in life.

The best results, however, are obtained by early detection and energetic treatment of the disease throughout pregnancy. With such a régime, it is now generally accepted that 96 per cent of the children are born healthy and saved from the dire effects of congenital syphilis. And in this promising work for the betterment of the race, every obstetric practitioner can have his full share. In fact, the splendid undertaking of the White House Conference must fail in this particular fight against congenital syphilis unless it is supported by the cooperation of the individual obstetrician.

—George Gellhorn.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

The Obstetric Literature of 1929

By J. P. GREENHILL, B.S., M.D., F.A.C.S., CHICAGO, ILL.

(Continued from page 600 of the April issue)

LABOR

General.—J. Kreis¹¹⁰ does not believe that the membranes are necessary for dilatation of the cervix. He advocates puncturing them when there is a small amount of dilatation and not when the cervix is completely dilated. (Rupture of the membranes should be performed only for a definite indication and after certain conditions have been fulfilled. If the head is not engaged when the membranes are to be punctured, the patient should first be placed in the Sims or the knee-chest position.)

E. Frey¹¹¹ is enthusiastic about the use of contraction-charts during labor. He contends that if spontaneous dilatation is to occur after premature rupture of the membranes it is usually accomplished after 150 uterine contractions. If dilatation is not complete after 200 contractions, spontaneous dilatation will not occur and a live child will not be delivered through the natural passages. (This is a revolutionary statement and if confirmed by others will be a strong argument in favor of the use of contraction-charts in all labor cases.) Delay in dilatation of the cervix in the presence of intact membranes has no deleterious effects for mother or child, hence the membranes should not be ruptured during the first stage of labor.

In the opinion of E. Philipp,¹¹² after rupture of the membranes, fetal hairs may always be found in the vaginal secretion if a careful search is made. The chief characteristics of a fetal hair are its pointed end and the presence of very little pigment. In a series of 6,500 cases, M. Schulze¹¹³ found that dry labor occurred in about 10 per cent. There was no maternal mortality and the morbidity was only slightly higher than that found in unselected cases. The fetal mortality was not higher than normal.

A. Stein in 1917 was the first to employ small doses of pituitary extract for inducing and shortening labor at term. He¹¹⁴ finds that a review of the literature bears out his own belief that when pituitary extract is administered in small and frequently repeated doses before delivery it offers a safe and effective method of inducing and shortening labor at term. M. Widera¹¹⁵ recommends the induction of labor by Stein's method but chiefly for patients in hospitals. (There is no doubt that pituitary extract when used after labor has once begun

even in 2 or 3 minim doses may occasionally do harm. For the induction of labor there is much less danger.) F. Demuth¹¹⁶ reports a series of 150 cases in which he used thymophysin to overcome weak uterine pains. In 35 cases there was only a moderate effect and in 9 cases no effect was observed. No harm resulted in any of the cases. (The reviewer used thymophysin in a number of cases of weak pains during the first stage of labor and was surprised at the rapidity with which the labors terminated spontaneously even though he never gave more than 3 minims at a time. The drug seems to be more potent than pituitary extract, hence only small doses should be used. It is seldom effective in starting labor but is helpful in cases of atony without exhaustion.)

Rupture of the membranes is the method of inducing labor suggested by D. L. Jackson,¹¹⁷ and according to D. G. Morton,¹¹⁸ the bougie is superior to the colpeurynter for this purpose. The latter is better for starting labor but it is attended by a definitely greater fetal mortality and maternal morbidity. In a series of 500 inductions of labor, R. Reiss¹¹⁹ employed six methods. Pituitrin alone was successful in 26 per cent, castor oil in 53 per cent, castor oil and quinine in 63 per cent, castor oil and pituitrin in 69 per cent, castor oil, quinine, and pituitrin in 73 per cent and bag insertion in 95 per cent. Stripping of the membranes markedly increased the percentage of success in each group but also increased the morbidity. J. D. Barris¹²⁰ reports a series of 134 cases in which labor was induced for disproportion by means of a bougie or rubber tube. The fetal mortality was 12 per cent and there was one maternal death. (In this country induction of premature labor for cases where disproportion may arise, is uncommon.)

O. Panek¹²¹ reviewed the labors of 107 patients sixteen years of age or less. The average duration of labor was considerably less than the average for primiparas in general. Labor was premature in 27.1 per cent. M. Schulze¹²² found that the dangers and difficulties of labor in elderly primiparas have been exaggerated. Neither fetal nor maternal mortality is increased above the normal and the average duration of labor is only slightly prolonged. O. Linden¹²³ studied the labors of 202 primiparous patients over forty years of age. He found only 40 per cent required operative interference and only one patient had a cesarean section. There was no maternal mortality but 10.2 per cent of the infants died. On the other hand E. Essen-Möller¹²⁴ maintains that labor in a primipara over forty years of age is more dangerous for both mother and child. Cesarean section should be done in a certain proportion of these women. S. Kimura¹²⁵ found a maternal mortality of 3.1 per cent and a fetal death rate of 9.9 per cent in a series of 140 primiparas over thirty years of age. (It is important to distinguish an elderly primipara who has been married to a potent husband a long time, and had difficulty becoming pregnant, from one who married late in life and conceived soon afterward. The former will probably have dystocia but the latter not much more than younger women.)

For demonstrating the mechanism of labor, H. Thoms¹²⁶ uses the dried calvarium of an infant's skull which fits easily over the folded fingers. F. H. Bardenheuer¹²⁷ found that the Herrmannsdorfer diet aided obstetric patients regardless of whether the delivery was spontaneous or operative. The patients are given an acid diet which consists chiefly of meat, fish, eggs, butter, bread and starchy foods, cheese, etc., and they are forbidden to eat alkalies.

J. Jareho¹²⁵ reviews the literature and states his own corroborative findings concerning the changes in the leucocytes during labor and the puerperium. The same author¹²³ discusses the rôle of posture in obstetrics. He found that the Waleher position increases the antero-posterior diameter of the inlet from 0.5 to 1.0 em. and in certain cases may facilitate engagement of the fetal head. He¹³⁰ later verified this directly by measuring the true conjugate with the obstetric inclinometer. The latter instrument which was devised by J. B. Jacobs¹³¹ measures the obstetric diameters, the inclination of the pelvis as a whole and the angulation of the various planes. (It is unfortunate that posture during labor is being more and more neglected because a change in position occasionally results in a surprisingly favorable advance in progress.) A. C. Williamson¹³² describes a new obstetric bed the main feature of which is the rolling down of the complete bunk, with the mattress attached, escalator fashion.

Analgesia and Anesthesia.—According to F. J. Schoeneck¹³³ combined morphine, scopolamine, and rectal ether gives good results in 85 to 95 per cent of labor cases. L. A. Emge and C. L. Cooley¹³⁴ believe that the Gwathmey analgesia is a distinct advance in the relief of labor pains and C. E. Hunt,¹³⁵ who reviewed 120 answers to a questionnaire found that 86 per cent of those who answered were favorably impressed with the Gwathmey analgesia. G. W. Gustafson¹³⁶ reports a case of quinine reaction after rectal analgesia. C. J. Gauss¹³⁷ maintains that the combination of pernocton and scopolamine appears to be the best analgesic during labor. E. Vogt¹³⁸ says that pernocton is both a narcotic and a soporific. He has used this drug in about 1,000 cases and considers it the ideal drug in obstetrics. P. Goetz¹³⁹ likewise praises pernocton and L. Löfkovits¹⁴⁰ who also thinks highly of it suggests that it be used only by specialists. W. Hole¹⁴¹ agrees that pernocton is an efficient and rapid analgesic but points out that when the dose is excessive, the patients become excited and pains cease altogether for a while. R. Kobes¹⁴² found bromine and barbituric acid in the urine of babies born of mothers who had been given pernocton and he also found bromine in the umbilical cord blood and the liquor amnii but not in the maternal milk. A. R. Robbins, J. T. C. McCallum, A. M. Mendenhall and L. G. Zerfas¹⁴³ used sodium amytal in a number of obstetric cases and found that the most serious objection to this drug was the difficulty in controlling the patients who became very restless. Labor was rendered practically painless and no harm was observed. E. and T. Better¹⁴⁴ recommend somnifène intravenously for the alleviation of pain during labor. (Pernocton is a bromine-barbituric acid combination and because it has a tendency to produce marked excitation, it should be used only in hospitals.)

R. Peterson¹⁴⁵ reports an explosion of ethylene gas which resulted in the death of a mother and her child. He believes it is best to return to the use of ether and nitrous oxide gas, because, in spite of all precautions with ethylene, explosions are possible from within the gas machine as it is at present built.

Spinal anesthesia is highly recommended by G. P. Pitkin¹⁴⁶ for

perineum is in great danger of being lacerated. J. R. Henry and L. Jaur¹⁴⁹ maintain that epidural anesthesia brings about painless labor while J. W. Kelso¹⁵⁰ unqualifiedly condemns caudal anesthesia for spontaneous deliveries. L. Portes¹⁵¹ reports seven cases in which he performed abdominal corporeal hysterotomy under local anesthesia. (Direct infiltration is much safer and just as efficient as spinal anesthesia for most obstetric operations. Episiotomy, forceps operation, cesarean sections and Porro operations can be performed with great ease under direct infiltration anesthesia.)

Complications.—I. Wilens¹⁵² emphasizes that the uteropubic fascia is an infrequent and not commonly recognized cause of dystocia. P. Findley¹⁵³ reviews the literature on acute puerperal inversion of the uterus and reports three cases which he saw in consultation. Findley advocates vaginal hysterectomy where vaginal replacement fails. On the other hand, L. E. Phaneuf¹⁵⁴ who treated three cases of complete inversion in four years advises laparotomy and correction by taxis when manual reposition fails. F. S. Kellogg¹⁵⁵ offers the following classification for inversion of the uterus: (1) Acute inversion when it is discovered before cervical ring formation. This is treated by immediate manual replacement from below. (2) Subacute inversion when it is discovered after cervical ring formation. The treatment for this is abdominal replacement by the Huntington technic. (3) Chronic inversion best corrected by a Spinelli type of operation from below.

Only eight cases of circular constriction of the fetal head were found in the literature by M. Oing¹⁵⁶ and she reports an additional case. She believes that primary rigidity and not a spastic muscular contraction of the cervix is responsible for these cases. J. P. Greenhill¹⁵⁷ answers Oing by citing his case of constriction of one thigh of a child by the cervix after the head and torso had been delivered. According to Greenhill, his case demonstrates that a true spasm of the cervix though extremely rare, can nevertheless occur.

A. M. Mendenhall¹⁵⁸ reviewed the literature on pituitary solution as a cause of rupture of the uterus and found a mortality of 78 per cent in 64 reported cases. (Not all such cases have been reported.) He believes that pituitary solution is valuable for postpartum hemorrhage, probably safe in the third stage of labor and for induction of labor if used cautiously, never safe in the first stage and rarely if ever safe in the second stage. H. E. Scheyer¹⁵⁹ reports five cases of spontaneous and seven cases of violent uterine rupture. He believes that extirpation of the uterus is not the treatment of choice, for in some cases the uterus may be left with impunity. L. S. Schwartz¹⁶⁰ operated upon four cases of perforation of the uterus and two of rupture of the uterus. In five of these cases conservative surgery was practiced and the patients recovered and have retained their menstrual and generative functions. Laffont and Larribère¹⁶¹ report 18 ruptures of the uterus among 6,500 confinements in the Algerian Maternity. L. M. Randall¹⁶² advocates the intravenous infusion of solution of acacia for shock in obstetrics because acacia fulfills all the requirements for intravenous treatment of shock except furnishing erythrocytes. A. Mandelstamm¹⁶³ discusses not only obstetric shock but also sudden death after labor. This author believes that the cause of obstetric shock is a disproportionate distribution of blood which causes an enormous amount of blood to remain stagnant in the abdomen. (There are many factors which tend to favor shock and among them are a long

and painful labor, dehydration, absence of rest and insomnia, fear, prolonged inhalation anesthesia, trauma, pituitrin and hemorrhage. All of these can be avoided.)

Operative Obstetrics.—W. J. Blevins¹⁶⁴ describes his method of repairing an episiotomy, N. H. Williams¹⁶⁵ advocates repair of the cervix on the ninth day postpartum, and W. O. Klein¹⁶⁶ discusses the suture of fresh perineal lacerations and episiotomies under local anesthesia. (There are many advantages in using local anesthesia. The usual risks of a general anesthetic are avoided, the field of operation is bloodless hence the repair can be performed with speed and accuracy, the scantiness of blood in the field is conducive to healing and there is no necessity to depend upon another individual for assistance.)

J. L. Baer¹⁶⁷ takes up the indications for and the technic of performing forceps operations and E. L. Cornell¹⁶⁸ discusses the technic of breech delivery. E. B. Piper and C. Bachman¹⁶⁹ reduce the factors which make for mortality in breech cases to compression of the cord, occurrence of a nuchal arm and difficulty in the birth of the after-coming head. Among 256 breech cases analyzed by W. E. Caldwell and W. E. Studdiford¹⁷⁰ there was a fetal mortality of 14 per cent and the policy was "hands off" as long as labor was progressing. At the Strasbourg clinic among 378 breech deliveries there was a maternal mortality of 1.08 per cent and a total fetal death rate of 20.1 per cent (F. Gateaux¹⁷¹). (In delivering a breech it is best to interfere only when necessary, take plenty of time, use green soap for lubrication, avoid excessive traction and use forceps on the after-coming head if difficulty is encountered.)

E. L. King and A. H. Gladden¹⁷² believe it is advisable to attempt to turn breech babies because among their 158 breech deliveries the fetal mortality was 10.1 per cent. G. Petrone¹⁷³ is likewise in favor of external version because in his series of 154 cases there was a death rate of 12 per cent for the living infants. H. Naujoks¹⁷⁴ reports a case of fatal intracranial hemorrhage in a newborn child as a result of external version. (External cephalic version should be practiced in all breech cases from the thirty-second week to term but only with gentleness and with constant control of the fetal heart tones. The Trendelenburg position sometimes helps.)

In a series of 100 versions performed according to the Potter technic, W. T. McConnell¹⁷⁵ had a fetal mortality of 15 per cent but only 2 per cent are attributed to the method. The author rightly insists that this operation should be performed only by an expert. At the Charité in Berlin prolapse of the cord occurred 182 times among 26,131 labors (0.7 per cent). The maternal mortality was 2.2 per cent and the fetal death rate was 46.7 per cent. Reposition of the cord had a mortality of 66.6 per cent whereas immediate delivery had a death rate of 14.3 per cent (E. Brandis¹⁷⁶).

it should be reserved for strict indications and P. Balard and E. Laequière¹⁷⁹ point out its dangers. Metzger,¹⁸⁰ Favreau¹⁸¹ and Mahon¹⁸² consider this procedure dangerous whereas J. C. de Carrera¹⁸³ and Guérin-Valmale and Verdeuil¹⁸⁴ believe it is excellent for cases of placenta previa. Cases where the Delmas method was used are reported by many authors.^{185, 186, 187, 188, 189, 190} (The Delmas method is accouchement forcé and is not without danger even in experienced hands.)

C. J. Miller¹⁹¹ points out the dangers connected with cesarean section. He properly emphasizes that the mortality of the average operator and the average mortality of all operators are much truer indices of the value of a given procedure than are the brilliant results of a single skillful surgeon or a single well-organized clinic.

In 1927 M. Hirsch¹⁹² of Berlin on the basis of statistics made a plea for an increase in the incidence of cesarean section and this started a flood of papers on the subject. The most important is that of Winter¹⁹³ who received information from 384 operators concerning 4,450 cesarean operations performed in Germany during 1928. The total maternal mortality was 7.1 per cent. Among 3,554 cervical operations the death rate was 3.7 per cent, for 438 classic operations it was 6.4 per cent, among 304 extraperitoneal operations it was 6.7 per cent and it was the same for 120 Porro operations. Winter believes that his analysis clearly shows that Hirsch's plea is based upon wrong premises. In a series of 450 cesarean sections R. Hornung¹⁹⁴ reports a maternal mortality of 4.2 per cent whereas among 695 vaginal operations it was 1.7 per cent. C. J. Gauss and v. Ammon¹⁹⁵ found that among 17,071 cesarean sections the total mortality was 5.8 per cent. It was lowest for the transperitoneal cervical operations. A series of 941 pregnancies after cesarean section were reported by 23 authors and the incidence of rupture of the uterus was 1.8 per cent, abortion occurred in 7.9 per cent and repeated cesarean section was done in 57.5 per cent. E. Martin and K. Spieckhoff¹⁹⁶ report a maternal mortality of 4.4 per cent for 405 abdominal deliveries and a mortality of 3.5 per cent for 1,114 vaginal operations. H. Krukenberg and H. Bodewig¹⁹⁷ found a death rate of 10.3 per cent among 426 cesarean sections and the best results were obtained with the cervical operation. In a series of 280 cases, H. Schroeder¹⁹⁸ records a mortality of 5 per cent. R. König¹⁹⁹ also disagrees with Hirsch and advocates in place of cesarean section, manual dilatation of the cervix and hypodermies of pituitrin during labor. H. Nevermann²⁰⁰ and also H. Albrecht²⁰¹ are others who oppose Hirsch. On the other hand, A. Hessler²⁰² reports a series of 113 cesarean sections without a maternal death and H. Dörfner²⁰³ also makes a plea in favor of Hirsch's idea.

In America we have likewise had analyses of cesarean section statistics. J. C. Hirst²⁰⁴ reports 84 operations with two deaths and favors the Kerr operation. C. B. Lull²⁰⁵ reports a maternal mortality of 6.4 per cent for 109 operations, and E. M. Hawks²⁰⁶ found a death rate of 3.6 per cent in a series of 582 operations. Among 79 cases mostly contaminated and operated upon by the newer types of cesarean section no death occurred. O. P. Humpstone²⁰⁷ reports a mortality of 4.3 per cent for his series of cases. N. Davis²⁰⁸ informs us that in the city of Houston among 51 cesarean operations performed by recognized surgeons and physicians, the maternal mortality was 33 per cent whereas among 56 cesarean sections performed by obstetricians the death rate was only 1.8 per cent. E. B. Piper and C. Bachman²⁰⁹ make a compari-

son of the corporeal and cervical operations and they recommend a special type of corporeal operation which has given them practically as good results as the cervical operations. In J. K. Quigley's²¹⁰ series of 165 cesarean sections the total mortality was 1.2 per cent, but there were no deaths for the 61 laparotrachelotomies.

H. W. Mayes²¹¹ is enthusiastic about the use of mercurochrome as a vaginal antiseptic before cesarean section and A. C. Beck²¹² describes an improved technic of the two flap, low incision, cesarean section.

J. P. Greenhill and B. Bloom²¹³ report a histologic study of uterine scars after cervical cesarean section. They studied 37 pieces of tissue removed at the time of repeated cervical cesarean sections from the site of the previous incision. In some cases the wound had healed so perfectly that no scar tissue could be found whereas in others, the scars were so thin that from an anatomic point of view it would seem almost certain that they could not stand a test of labor. Nevertheless, two of five such scars did stand this test. (The above staggering array of figures indicates that too many cesarean sections are being done. This helps to keep up the high maternal mortality which is by no means indigenous to the United States. The statistics quoted unquestionably bear out the fact that the cervical cesarean section is far superior to all the other types and the almost routine use of local anesthesia will make it still safer. Cesarean sections should be performed whenever possible by specialists and not by general surgeons and practitioners. Occasionally the proper thing to do is a craniotomy and not a cesarean section. However, some men place such a high value on the child's life even though the child is dying, that they forget there is such an operation as craniotomy and they cause the woman's death by doing a cesarean section. At the Chicago Lying-In Hospital during the last fourteen years among 874 cervical operations, more than half of which were performed under local anesthesia, the maternal mortality was 1.26 per cent.)

D. A. Horner²¹⁴ reports three cases of bursting of the abdominal wound after cesarean section and he takes up the treatment of this condition. K. Kaiser²¹⁵ reports such a case also.

Uterine Hemorrhage.—L. A. Calkins²¹⁶ found that the age of the mother and parity have no effect on the amount of blood lost in the third stage of labor. S. Szenteh²¹⁷ administered calcium intravenously in 40 cases of postpartum hemorrhage and the results were excellent. F. H. Bardenheuer²¹⁸ maintains that if calcium is injected intramuscularly one or more hours before labor, the amount of blood lost in the third stage will be reduced about one third. L. Devraigne and M. Mayer²¹⁹ successfully treated four cases of severe hemorrhage by intravenous injections of citrated serum. M. Lefi²²⁰ says that the placenta separates promptly after the birth of the child and the only possible way to find this out is to make a vaginal examination. (The routine use of vaginal examination by unskilled individuals for the determination of placental separation will undoubtedly lead to serious consequences.)

In a series of 65 cases of placenta previa, H. C. Williamson²²¹ reports a maternal mortality of 7.7 per cent and a fetal death rate of 47.7 per cent. Thirty-one patients were treated by colpeurynter, version and extraction and packing and five by cesarean section. F. H. Lacey²²² analyzed the records of 562 cases of placenta previa and the maternal mortality for the various methods of treatment was as follows: rupture

of membranes (126 cases) 2.3 per cent, natural forces (76 cases) 2.6 per cent, external version (28 cases) 3.5 per cent, internal version (228 cases) 7.4 per cent, internal version and extraction (17 cases) 17.6 per cent and cesarean section (33 cases) 6 per cent. At the Strasbourg clinic, A. Ginglinger and S. Assovatz²²³ inform us, during the last ten years, the treatment of placenta previa has varied from delivery from below to the classic cesarean section and finally to the cervical operation. B. Solomons²²⁴ found that in the last 55 cases treated at the Rotunda there was no maternal death. (The reviewer believes that most primiparas with placenta previa and most multiparas with central placenta previa should be delivered by the cervical cesarean section. Multiparas with lesser degrees of placenta previa and without much blood loss should be treated by more conservative means. When delivery is accomplished vaginally, it must be done very slowly. Saline and blood transfusions should be given where necessary. All patients with placenta previa should be sent to a hospital.) R. A. Bartholomew²²⁵ discovered toxemia 33 times among 61 patients who had abruptio placentae. He believes that induction of labor, watchful expectancy, stimulation and supportive therapy offer the best prognosis. According to A. A. Blagodarow²²⁶ there are in the literature only 40 cases of placenta accreta and he reports an additional case.

PUERPERIUM

General.—According to F. B. Smith,²²⁷ the salient features in the care of the breasts are cleanliness, support, alertness on the part of the physician and avoidance of trauma. He recommends sodium hypochlorite solution as a breast antiseptic. To increase the secretion of milk, M. Wachtel²²⁸ recommends the use of sun lamps and to suppress the flow he suggests thyroid medication. Among 500 puerperal women H. O. Neumann and M. Oing²²⁹ found that 6.8 per cent had supernumerary breasts or nipples.

J. Jareho²³⁰ found substantial agreement in the Wassermann reaction in the blood and milk in 95 per cent of 107 patients. Blood examinations made on 25 afebrile patients by E. Kulka²³¹ revealed that the white cell count rose as high as 18,000 before labor and became normal by the fourth day postpartum. Immediately after delivery the count went as high as 29,000 and this is attributed to invasion of the blood stream by bacteria. The same author²³² examined the blood of 40 patients immediately after labor regardless of whether or not they had fever and he obtained positive blood cultures in 7 cases (17.5 per cent). G. Klapsia²³³ found bacteria in the blood within three or four hours after labor in nearly all afebrile cases, but after twenty-four hours fewer blood cultures were positive. (Postpartum chills are most likely due to bacteremia.)

Sepsis.—In a series of 2,016 deliveries reported by C. A. Gordon²³⁴ in which there was no preparation of the vagina, the morbidity was 3.6 per cent, and D. Kuperstein²³⁵ found that iodine externally employed compared well with mereurochrome even when the latter is applied both externally and in the vagina. M. S. Tansinsin²³⁶ reports a morbidity of 19.9 per cent for 446 labor cases. (We need a uniform standard of morbidity in this country.)

J. Hofbauer²³⁷ found that he can stimulate the bone marrow in puerperal women by means of pituitary solution followed by intravenous administration of hypertonic glucose solution.

In Massachusetts during 1928 there were 456 deaths in the puerperal state of which 27 per cent were due to sepsis.²³⁵ C. Jeamin and M. Sureau²³⁹ found that among every 1,000 women who give birth, 25 develop puerperal infection and six of the 1,000 die but only 2 deaths are due to sepsis. It is the belief of Albert²⁴⁰ that up to the fourth or fifth month of gestation, almost every uterus contains bacteria and this condition gradually subsides until at the time of labor only 50 per cent of the uteri have what the author terms "latent infection." The author believes that the following conditions may be attributed to latent infection of the uterine cavity: eclampsia, spontaneous febrile abortion and premature labor, anomalies of the placenta and frequently intra-uterine death of the fetus. (There are many truths in this article.) F. L. Adair and L. J. Tiber²⁴¹ found among 8,000 patients that those who had scarlet fever in childhood had a lower incidence of puerperal infection than those who did not have this childhood disease. This is probably due to the fact that women who previously had a streptococcus infection are less liable to a morbid puerperium. M. Salmon and B. Turner²⁴² saw no significant difference between Dick-positive and Dick-negative pregnant women as regards fever during the puerperium. In a series of 113 cases of puerperal infection J. W. Harris and J. H. Brown²⁴³ found streptococci in the uterine cavity in 67 per cent. Aerobic and anaerobic streptococci were found with about equal frequency.

A new concentrated streptococcus antitoxin was given by A. F. Lash²⁴⁴ to 57 women in various stages of puerperal infection and the mortality was 32 per cent. In a control series the death rate was 61 per cent. In another paper Lash²⁴⁵ reports a series of 1,261 puerperal women who were vaccinated with streptococcus vaccine and the incidence of puerperal fever was 0.87 per cent as contrasted with 2.8 per cent for an unvaccinated series. G. Gibson²⁴⁶ treated postpartum infection by subcutaneous injection of blood and among 23 patients 3 died. J. Wozak²⁴⁷ used the Warnekros serum in 25 patients and he noticed only slight benefit. H. Küstner²⁴⁸ advocates the use of grape sugar and Ringer solution in combination with serum therapy for puerperal sepsis. For the same condition J. B. Bernstine²⁴⁹ recommends intravenous metaphen, Devraigne, Sauphar and Mayer²⁵⁰ and also Audebert and Estiemy²⁵¹ advocate intravenous injections of aseptic pus. Le Lorier²⁵² extols intravenous novarsenol, P. Oginz²⁵³ favors intravenous rivanol and S. S. Rosenfeld²⁵⁴ recommends the application of neutral acriflavine into the uterine cavity for the prophylactic treatment of puerperal infection. J. Audebert and J. B. Giscard²⁵⁵ praise the use of auto-vaccinotherapy in gonorrhoeal infection during the puerperium.

Among 90 cases of sepsis studied by C. Clanberg and H. Kötter,²⁵⁶ 26 followed labor and 64 occurred after abortion. The death rate was 57.5 per cent for the abortion group and 61.5 per cent for the labor series. In the 67 autopsies performed, it was found that the greatest source for the origin and spread of infection was the parametrium. L. v. Büben²⁵⁷ reports three fatal cases of tonsillitis during pregnancy and labor, Rhenner and Savoye²⁵⁸ record nine cases of typhoid fever during the puerperal state and L. Devraigne, L. Baize and M. Mayer²⁵⁹ report six cases of puerperal scarlet fever.

N. Ellerbrock²⁶⁰ reports three cases of puerperal gangrene where ergot was used but denies there is any danger of gangrene if ergot

preparations are given in proper doses. H. Saenger²⁶¹ found 13 cases of gangrene which followed the use of gynergen (ergotamin tartrate) in the literature. All the patients had sepsis, and he explains the gangrene on the basis of infectious-toxic changes in the blood vessels. Puerperal gangrene without septic infection does not appear to occur because huge doses of ergotamin are necessary to produce gangrene. H. Guggisberg²⁶² agrees with Saenger. W. Uter²⁶³ reviewed the literature on gynergen and he outlines his indications for the use of this drug. (Gynergen is one of the best hypodermic preparations of ergot.)

THE NEWBORN

Physiology.—H. and R. M. Bakwin²⁶⁴ found that newborn infants lost considerably more weight during the winter than during the summer and they had fever more often during the winter. K. Sugiura²⁶⁵ found a relationship between the seasons of the year and the sex of children born in Japan. M. T. Macklin²⁶⁶ collected from the literature 1,600 cases with which she refutes Still's theory that primogeniture, as such, plays a large part in the production of developmental defects.

C. Holtermann²⁶⁷ points out that fetal arrhythmia in overterm children is an early symptom of impending death. The practical significance of this observation is that the child should be delivered without delay as soon as the irregularity is found, but it is advisable to wait until the irregularity has been observed at least twice. A. Mathieu and A. Holman²⁶⁸ discuss resuscitation of the asphyxiated newborn, and they recommend the use of the tracheal catheter after the air passages are cleared of foreign material. (The tracheal catheter is the simplest and most efficient means of resuscitating a baby.)

Complications.—W. C. Danforth²⁶⁹ discusses neonatal mortality and he considers measures for decreasing this. A. Couvleaire²⁷⁰ informs us that at the Baudeloque clinic there were 45 fetal deaths for every 1,000 births and of these 14 occurred during pregnancy, 19 during labor, and 12 during the first three days of life. This mortality is being decreased by antisiphilitic treatment and by the prevention and treatment of pregnancy toxemias.

J. C. Douglas and V. Stone²⁷¹ discuss the prevention of ophthalmia neonatorum. E. Kellert²⁷² controlled impetigo neonatorum by using 50 to 60 per cent glycerin, and E. T. Rulison²⁷³ checked impetigo by changing the nursing supervision of the babies. H. Ehrenfest²⁷⁴ discusses the ever-timely question of intracranial birth injuries. He says "The physiologic traumatization of the brain and meninges in labor can be reduced to its possible minimum by absolute nonintervention during labor that is progressing normally, excepting in this respect an episiotomy and truly perineal forceps applied to a maximally compressed head. If, in the interest of either the mother or the child, intervention is considered necessary, haste almost invariably will increase the danger of the child. Serious harm will be obviated if the seemingly asphyxiated child is always considered as probably having been intracranially traumatized." H. Yagi²⁷⁵ found intracranial hemorrhage in 34.3 per cent out of 178 autopsies on stillbirths. The same author²⁷⁶ advocates the use of barium sulphate injections followed by x-ray pictures for the detection of intracranial hemorrhage. M. F. Eades²⁷⁷ found that operative deliveries, especially forceps, play a major rôle in the causation of retinal hemorrhages but the latter are not

constant in cases of intracranial injury. P. L. Schroeder²⁷⁸ discusses the behavior difficulties in children associated with results of birth trauma.

It was found by M. Lange²⁷⁹ that 3 per cent of the patients who entered a large orthopedic clinic had deformities which could be traced to an obstetric trauma and that 50 per cent of these cripples are incurable. B. Hukewytsek²⁸⁰ emphasizes that fracture of the clavicle in spontaneous deliveries of head presentations occurs more frequently than it is diagnosed. However, it heals quickly and without functional disturbances.

In a series of 765 patients in whom quinine was used to induce labor, W. J. Dilling²⁸¹ believes the drug may have been responsible for eight stillbirths (1.04 per cent). J. R. McCord²⁸² reports an interesting study of 200 autopsies made on syphilitic babies. He maintains that syphilis is only transmitted to the baby by way of the placenta and that the lesions of the long bones as demonstrated by the roentgen-ray are pathognomonic of fetal syphilis. Even moderate antisymphilitic treatment during pregnancy will save a majority of the babies. F. Gereken²⁸³ points out that patients with syphilis must be treated during pregnancy regardless of whether they were treated before pregnancy. P. P. Müller²⁸⁴ reviews the literature on defects of the scalp in the newborn which are due to syphilitic infection during labor.

A very extensive and valuable series of articles have been written individually and together by L. Goldstein and D. P. Murphy.²⁸⁵ They collected all available data on the effect of both preconceptional and postconceptional radiation on the mother and on the newborn, and they performed animal experiments as well. They found that irradiation during pregnancy is fraught with great danger to the child because many defective children are the result. An unusually large proportion of these children have microcephalus. On the other hand "there is as yet no definite indication that ovarian irradiation prior to fertilization has any detrimental influence upon the health or development of any subsequent children." Pregnancy may occur during a period of amenorrhea between roentgen exposures and subsequent treatment may damage the embryo. P. Toombs²⁸⁶ emphasizes that diagnostic exposure of x-ray is not harmful unless it is repeated too frequently but therapeutic exposure causes abortion and deformities of the fetus. W. Unterberger²⁸⁷ reports a roentgen-ray injury to a fetus due to repeated fluoroscopic examinations during pregnancy.

R. Kobes²⁹² and also of J. Putz²⁹³ that an intact placenta always floats horizontally but the converse is not true. E. Philipp²⁹⁴ points out that spirochetes go through the placenta and without producing any tissue damage whereas streptococci traverse the placenta only after destruction of the villous epithelium. The human placenta is a distinct protection against infection of the fetus, but this is not true of all diseases. F. L. Adair and R. E. McDonald²⁹⁵ reviewed the literature on varix of the umbilical cord and they report a case.

MISCELLANEOUS

A strong and logical plea is made by E. D. Plass²⁹⁶ for the simplification of obstetric care. Among the essentials necessary to obtain better medical care for women patients, C. H. Davis²⁹⁷ considers governmental activities directed toward a survey of the causes of maternal and infant deaths, and more institutions in which physicians who specialize in obstetrics and gynecology may obtain the necessary training. A. M. Mendenhall²⁹⁸ emphasizes that our students are graduating with little worth-while training in obstetric surgery and that opportunities for postgraduate study are insufficient to supply the demand. F. W. Rice²⁹⁹ likewise sees room for improvement in the teaching of obstetrics but includes the training of nurses and midwives in his program.

According to M. Nicoll,³⁰⁰ in the registration area for 1927, 19,837 women died from causes directly connected with childbirth. He says "before permitting ourselves to indulge in too violent self-condemnation let us be certain that the figures of other countries are as accurate as ours and based on identical methods of allocating causes of death. . . . No nation except ours is called upon to face such a racial variation in fitness for motherhood." O. N. Eastman³⁰¹ found that among 489 maternal deaths in Vermont, one-third were due to albuminuria and convulsions, one-fourth to sepsis, and one-fifth to hemorrhage. G. F. Gibberd³⁰² points out that in England the maternal mortality rate in the last sixty years has fallen from 4.4 per 1,000 to 1.03 per 1,000 and this can be traced to changes in obstetric methods. J. O. Polak assisted by C. Clark³⁰³ emphasizes that the mortality directly attributable to childbirth is largely preventable. Childbirth can be made safer by the intelligent application of the physiologic mechanism of labor and adherence to strict surgical technique. In the presence of complicating diseases the pregnancy in most instances can be disregarded and attention given to the treatment of the disease. R. W. Holmes, R. D. Mussey and F. L. Adair³⁰⁴ agree that the most important factor in the lowering of our death rate is provision of suitable institutions and of a well-trained personnel to provide proper care for the mother during pregnancy, labor, and the puerperium. The laymen must be educated to the dangers of abortion, toxemias, and infection, and they must realize the importance of good care during pregnancy, labor, and the puerperium.

According to J. P. Kinloch³⁰⁵ the maternal death rate in Scotland for 1928 was 70 per 10,000 births and 24 of these were due to sepsis. He quotes the Aberdeen report which shows that during a ten year period the death rate per 10,000 maternity cases was 28 in the practice of midwives, 69 for the doctors, and 149 in hospital practice. All of the deaths were transferred back to the original doctor or midwife in charge of the case. The view is advanced that the higher incidence of puerperal sepsis in the practice of doctors as contrasted with that of

midwives, is due in part to a streptococci carrier condition in doctors. (This is undoubtedly true.) If the risks of contagion in maternity hospitals is to be restricted, then the number of patients and their spacing in the wards must be rigorously controlled. M. Rosensohn³⁰⁶ informs us that at the New York Lying-In Hospital there were 25 maternal deaths among 5,001 patients. There were 164 cesarean sections with a death rate of 2.4 per cent. According to J. Lal Das,³⁰⁷ about 20,000 women die during pregnancy and labor in India each year because in certain provinces most mothers do not receive any skilled attention.

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Selected Abstracts

Miscellaneous Abstracts

Warner, Allen: An Achondroplastic Twin. *British M. J.* 2: 983, 1928.

The case of an achondroplastic twin is reported. The twins were ten and one-half years old. The one weighed $7\frac{1}{2}$ pounds at birth; at present he has the height of a boy of fourteen years. The other twin also weighed $7\frac{1}{2}$ pounds at birth and at present has a height of $40\frac{1}{2}$ inches. He shows all the characteristics of achondroplasia.

Although these twins were of the same sex, they are so very different that it can be taken for granted they were developed from two distinct ova.

ADAIR-BRUSEGARD.

Witkin, W.: A Parasitic Fetus. *J. M. A. South Africa* 3: 252, 1929.

This is a report of a parasitic fetus attached to one of twins born by a para iii. The child or autosite was alive, weighed about 5 pounds, but was cyanotic and poorly developed. The parasite was attached to the thorax of the autosite near the xiphoid by a long pedicle so that the lower extremities were astride the autosite's abdomen. Heart, heart, lungs, and liver were entirely absent and the upper extremities were rudimentary. From the waist down it was well formed. The lower extremities were equal. It had a well formed penis through which urination occurred, but the anus was imperforate. No response of parasite could be elicited to skin irritation, but autosite responded. The child presented an umbilical hernia through which bowel protruded and for which it was operated upon the day following delivery. Recovery was uneventful except for some difficulty in keeping the wound dry of the parasite's urine. The child's general condition improved following this operation, but it later again went downhill so that when ten weeks old a second operation was performed to remove the parasite. Healing occurred with some slough. A month after the operation the child was still alive, taking the breast and having normal stools.

FRANK SPIELMAN.

Chatillon F.: Five Cases of Pseudocyesis. *Schweiz. med. Wchnschr.* 59: 530, 1929.

The author reports five cases offering the usual symptoms of enlargement of the abdomen, and all the concomitant symptoms of a pregnancy. As to cause, it seems important that two of the patients were approaching menopause and this disturbance is usual at that time. These patients usually have a persistent amenorrhea or scanty catamenia. There always exists a persistent desire for children. The background of the condition is probably ovarian in origin.

A. C. WILLIAMSON.

Laffont and Larribère: Twelve Cases Treated by a Modification of Henkel's Procedure. *Bull. Soc. d'obst. et de gynéc.* 9: 836, 1928.

The authors employed Henkel's method of clamping the uterine arteries through the vagina in twelve cases of severe postpartum hemorrhage. They used the usual clamping forceps instead of Museux clamps. Three patients died. The clamps

were left in place usually for two hours but in one instance for six. No urinary disturbances were noted and infection was observed only twice. Both of the latter patients had placenta previa. In all the cases the authors felt that the only other methods of choice were hysterectomy or tamponade.

J. P. GREENHILL.

Shaw, Wilfred: A Case of Adenomyolipoma of the Fallopian Tube. *J. Obst. & Gynec. Brit. Emp.* 35: 725, 1928.

This is the fifth case of lipoma of the fallopian tube recorded and is remarkable in that a combined lipoma and adenomyoma was present. The tumor was found in a nulliparous woman of forty years of age, presenting irregular bleeding of several years' duration. It was about $\frac{3}{8}$ inch in diameter, and situated near the right cornu resembling a subperitoneal fibroid. Histologically it was a lipoma in the substance of which adenomyomatous tissue was present.

FRANK SPIELMAN.

Joachimovits, R.: Uterine Sounds Especially Ringing Uterine Noises. *Monatschr. f. Geburtsh. u. Gynäk.* 81: 1, 1929.

In a few cases the uterine sounds are ringing or whistling and the ringing sounds are heard more frequently on the right side. The cause for this kind of sound is torsion of the uterus with resulting bending of the main blood vessels. Natural or artificial meteorism produced by the injection of air in the large intestines usually increases the intensity of the uterine sounds but does not make it ringing in quality. These sounds are heard through the abdomen only in human beings and in monkeys, but in most animals the sounds may be heard through the rectum. Generally the sounds are heard loudest on the side where the fetal heart tones are most distinct. During labor pains the sounds are weakened or inaudible.

J. P. GREENHILL.

Vigholt, W.: Torsion of the Tube with Secondary Hematosalpinx. *Acta. Obst. et Gynec. Scandinavica* 7: 310, 1928.

The author reports a case in which there was torsion of a hematosalpinx in a seventeen-year-old unmarried woman. Histologic examination revealed hemorrhage not only in the lumen but also in the wall of the tube. No signs of inflammation or pregnancy could be detected. Of the 38 cases of uncomplicated torsion of the fallopian tube or adnexa reported in the literature, about three-fourths were of isolated torsion of the tube. In most cases the hematosalpinx was secondary to the torsion.

J. P. GREENHILL.

Panek, O.: The Course of Labor in Adolescents. *Med. Klin.* 25: 376, 1929.

only 19 of the 107 patients were the pelvic measurements normal; hence in the large majority of cases the pelvis was still in the process of growth. However, this fact had no practical significance as far as labor was concerned. A most striking phenomenon was the occurrence of only 79 full-term labors out of 107, hence 27.1 per cent of the labors were premature. All of the full-term children were born alive, whereas of the premature children two were stillborn and a third died soon after birth. There was no increase in abnormal presentations in this series, but many patients had lacerations of the soft parts. The third stage of labor was normal in all but three instances. There were three cases of eclampsia in this group. In 93 patients the puerperium was afebrile.

J. P. GREENHILL.

Pfalz: Contraceptive Silk-worm Loops as a Cause of Severe Metritis: Critical Considerations of the Value and Action of Intra-uterine Contraceptive Measures. München. med. Wehnschr. 30: 1248, 1929.

Pfalz discusses the need, under modern social conditions, of an effective, and, at the same time, harmless method of contraception. He says that none of the present methods in use are invariably effective and without danger to health. Among the newer instruments, he describes an intrauterine pessary devised by Braun and Pust, which consists of a cervical cap, made of the finest glass, to which is attached a silkworm loop covered by silk. This loop is inserted into the uterine cavity. It swells by absorption of fluid and thus retains its position. Theoretically, its action is supposed to be mechanical and chemical, the glass cap keeps most of the spermatozoa out of the uterus, while those that slip by are killed by the secretion induced by the presence of the pessary. Pfalz believes, however, that this, in common with other intrauterine pessaries, acts by interfering with the implantation and development of the ovum, i.e., it acts by inducing abortion rather than by preventing conception. He reports a case in which such a pessary was introduced. In some manner, and without the knowledge of the patient, the glass cap was lost. Later, the patient developed profuse meno- and metrorrhagia with severe lower abdominal pain and anemia. Vaginal hysterectomy was performed. Section of the specimen showed the remainder of the pessary in the cavity of the uterus. On the basis of this case, and the belief that the instrument is an abortifacient rather than a contraceptive agent, the author advises strongly against its use.

A. SHULMAN.

Danforth, W. C.: The Prevention of Neonatal Mortality from the Standpoint of the Obstetrician. Illinois M. J. 46: 166, 1929.

It is estimated that about 20,000 women and 120,000 infants are lost yearly in the United States from causes incident to pregnancy and labor. Numerous other women are left in a condition of greater or less invalidism as a result of trauma or infection. Also, injuries to infants give rise very often to individuals greatly handicapped throughout life. In the author's estimation 85 per cent of this maternal and 50 per cent of the infant morbidity is preventable. Careful prenatal observation followed by intelligent, painstaking, and conservative treatment during labor will show definite results. Infant care by the pediatrician instead of the obstetrician is urged. Results at the Evanston Hospital in 837 deliveries during the past year showed an infant mortality of 3.8 per cent.

FRANK SPIELMAN.

Smith, Lillian Richardson: *Maternal Mortality in Michigan*. *The Medical Woman's Journal* 36: 34, 1929.

A study of the five principal causes of death of women in each five year group from fifteen to forty years for the year 1927 was made in Michigan.

1. Between 15 and 19 years of age: tuberculosis ranks first; childbirth second; automobile accidents third; lobar pneumonia fourth and appendicitis as fifth cause.

2. Between 20 and 24: tuberculosis; childbirth; lobar pneumonia; chronic heart disease; acute heart disease as fifth and least frequent cause.

3. Between 25 and 29: tuberculosis; childbirth; chronic heart disease; lobar pneumonia; cancer.

4. Between 30 and 34: tuberculosis; childbirth; cancer; chronic heart disease; chronic nephritis.

5. Between 35 and 39: childbirth; tuberculosis; cancer; chronic heart disease; lobar pneumonia.

There were 819 cases studied, of these 78 were less than twenty; 159 were from thirty to thirty-four; 439 out of 819 were under thirty years; 166 were between twenty and twenty-four; 195 were between twenty-five and twenty-nine; 156 were between thirty-five and thirty-nine; and 65 were forty or over.

In a detailed study of 819 maternal deaths the following causes of death were ascertained: septicemia (359); convulsions and albuminuria (167); hemorrhage (95); accidents of pregnancy (79); and accidents of labor—operative deliveries or cesarean section (57).

It was found that of these 819 women dying in childbirth 447 had no care at all, only 175 regular prenatal care and 156 irregular prenatal attention.

Abortions caused 231 of the deaths (28 per cent), 181 of these being due to septicemia; in only 4 of these 231 women was abortion induced for therapeutic purpose.

Of the 819 patients dying, only 115 received good hospital care, thus many more had no hospital care at all.

Of the 359 women who died from septicemia, in 181 death occurred subsequent to abortions.

Of the 167 deaths from convulsions and albuminuria, only 33 had adequate medical care during pregnancy.

As the result of this investigation the Department of Health of Michigan has decided (1) to acquaint the medical profession with the factors entering into these deaths; (2) to send prenatal letters to all prospective mothers; (3) to conduct prenatal classes all over the state, and (4) to arrange for talks given by physicians on infant mortality and how to better their conditions.

ADAIR-LIPPMAN.

Das, Jahar Lal: *Maternity and Child Welfare*. *Indian M. Rec.* 49: 33, 1929.

ception, and of the child before and after birth. Regarding welfare of the mother, it is to be remembered that while the function of child-bearing is a normal physiologic one, even under the most favorable circumstances it takes its toll on maternal life and health.

The question of making skilled aid available to the mother during childbirth is of paramount importance. In Western countries practically every labor case is attended by a doctor or a qualified midwife; whereas in this Eastern province by far the largest number of mothers do not receive any skilled attention during either pregnancy or labor.

Regarding mortality among children in India, 246 per 1,000, close to 25 per cent, died within twelve months of birth in 1926. The figure for Bihar and Orissa for 1926 was 147.7 and for 1927 133.4 per 1,000 live births.

Maternity and child welfare work is in its infancy in this province, but the problem is being tackled. Skilled supervision during pregnancy will no doubt prevent a large number of stillbirths; it will also ensure the birth of a larger number of healthy children, and will give that good start in life to the newborn which is so essential.

C. O. MALAND.

Heckscher, S.: The Kauffmann Diuresis Test and Its Significance as Regards Operability in Gynecology. *Monatschr. f. Geburtsh. u. Gynäk.* 82: 317, 1929.

The Kauffmann diuresis test is a simple clinical test of the circulatory system and is of value before operating on gynecologic patients. The prognosis is good if the elimination of fluid before and after the test measures about 300 to 450 c.c. and if the ratio before and after is between 100:100 and 100:130. If the ratio is above 100:130, the prognosis is bad. During pregnancy and menstruation the ratio is frequently above 100:130, due to the effect of the glands of internal secretion on the circulation. In gynecology the ratio is most frequently abnormal in cases of myoma of the uterus.

J. P. GREENHILL.

Kaiser, K.: Late Dehiscence of Abdominal Wounds. *Monatschr. f. Geburtsh. u. Gynäk.* 82: 322, 1929.

The only disadvantage of the longitudinal abdominal incision is the danger of hernia; but the presence of pus may produce a hernia regardless of whether the incision is longitudinal or transverse, and regardless of whether catgut, silk, or silkworm is used. The author reports the case of a young woman on whom a cesarean section was performed in September, 1926. On the tenth day, after having had an abscess in the abdominal wound, the wound edges separated and there was an evisceration of the viscera. The intestines and omentum were replaced, and the wound edges were approximated with bandages. The patient recovered, but a hernia remained. On October 22, 1928, two years later, the patient was suddenly awakened at 2 A.M. without any special reason. Her abdomen felt wet and she realized that the wound had ruptured and the intestines had escaped on to the abdomen. The patient was rushed to a hospital, and the intestines were replaced within the abdomen. The edges of the wound were freshened and sewed together. The wound healed by first intention, and there was no sign of peritonitis. On December 29 the hernia was repaired and again an abscess developed; but this time as well as at the time of the cesarean section it was observed that in spite of the pus, the silk sutures in the fascia held firmly.

J. P. GREENHILL.

I N C O M P L E T E

In this volume pp. 739 to onwards are missing